

COMPARATIVE STUDY OF HERBAL AGENTS USED FOR FUMIGATION IN RELATIONS TO FORMULATION*

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ABSTRACT : *The study assess some herbal agents used for fumigations as listed in Ayurvedic literature for various applications. Here coarse powder of 19 freshly collected and dried herbal agents were used for fumigating a room of about 594 cu .ft. volume. Air samples were collected using Nutrient Agar plates just before , 15 minutes and 45 minutes after fumigation from both ground and top. Assessment of the agent was done by means of colony counts after incubation of air samples . In relation to Formaline (disinfection by 100%) all the herbal agents have reduced the microbial colony counts in air samples considerably. Five agents were markedly effective in destroying micro-organisms in ground samples while the rest have disinfected significantly the top samples. Potent disinfection was seen with “Devadāru” and in line “Apamārga” stands second while “Sarsapa” has reduced aerogenic micro-organisms.*

Introduction

Usage of dried plant material for fumigations has been common practice in Vedic rituals. Most of these agents were described , in addition to Sun (Surya) and fire (Agni) as affective agents to destroy “Kṛmi” and “Rāksasa” the visible and invisible organisms that cause disease¹. “An organism with malignant character, which is to be guarded off” is referred to as “Rāksas” and the measures to drive out the “Rāksa” and the measures to drive out the “Rāksa” is called “Raksoghna”². “Raksoghna karma” described in vedic literature, has correlations to the aseptic and disinfectant procedures of modern science and there are more than 100 herbal agents used for this purpose³. “Raksoghna” indicated by ‘Susruta’

for various surgical problems, are also meant to purify

The hospital environment like operation theatres, wards etc⁴.

The present study was undertaken with an objective to evaluate some of the such commonly available herbs and compare their efficacy in relation to Formaline, so that vedic knowledge is unfolded to practical application. Herbs used in this study were selected in view of their availability.

- 1) Apāmārga --- *Achyranthus aspera* Linn: Amaranthaceae (whole plant)
- 2) Arka – *Calotropis procera*; Ait; Asclepiadaceae (Root).
- 3) Devadāru --- *Cedrus deodara*; Roxb; Pinaceae (wood scrap)

- 4) Dronapuspi --- *Leucas cephalotes*; Spreng; Lamiaceae (whole plant)
- 5) Eranda --- *Ricinus communis*; Linn; Euphorbiaceae (Root).
- 6) Grandhi tagara --- *Valeriana Wallichii*; DC; Valerianaceae (Rhizome).
- 7) Sarsapa --- *Brassica nigra*; Koch ; Crucifereae (seeds).
- 8) Satāvāri --- *Asperagus racemosus* ; Linn; Lilliaceae (Stem)
- 9) Sirisa --- *Albizzia lebbeck*; Benth; Fabaceae (Bark)
- 10) Vaca – *Acorus calamus*; Linn; Araceae (Rhizome).

Material and Method

The material used in this study was mainly collected by the department of pharmacognosy except Sarsapa and Devadāru which were procured by other means. Selected part was collected fresh and dried complete in an incubator at and 37°C. Then it was pulverized to a coarse powder and was used for fumigations by sprinkling about 15gms. On well ignited coal; A cubicle measuring 9 x 6 x 11 ft. (594 cu. ft.) was used for the entire experiment. Two air samples were collected by plate exposure method, one from the ground and another from top; and were labelled as A1, A2. Following first sampling the room was fumigated for 15 minutes and the source of fumes was taken by the same method at the interval of 15 and 45 minutes after fumigations and were labelled as B1 and B2 and C1 and

C2 respectively. These samples were incubated for 24 hours and colonies grown were counted using Electro magnetic colony counter. Following each fumigation, the cubicle was kept open for two days before another agent was tested. The comparative disinfectant, Formaline was used as per the standardized method. Air sampling was done for control agent (Formaline) also, before and after the procedure. Each agent was evaluated for it's efficacy in reduction of the aerogenic colonies of microbials and compared with formaline taking it's efficacy as hundred per cent.

Results

Colony counts in plates A1 A2, B1 B2 and C1 C2 along with percentages of reduction with each subject are shown in table -1. Table -11 shows the details of "optimal disinfecting effect" of each agent used for fumigation and this is also indicated by histogram bars. In relation to Formaline a minimal efficacy 36.6% was achieved by Eranda and maximum disinfection by Devadāru was 96.4%. of the 10 herbal agents used in this study for fumigations 7 samples were effective after 45 minutes, while 3 samples have disinfected the area to their optimum during first 15minutes. Optimal efficiency was seen for 5 agents in ground samples while for the rest it was at top samples,

Table 1: Showing the effect of fumigations on bacterial colony counts

S.NO	Name of the agent	Ground Samples					Top Samples				
		A ₁	B ₂	%	C ₁	%	A ₂	B ₂	%	C ₂	%
1)	Formaline (std)	35	0	100	0	100	38	0	100	0	100
2)	Apāmārga	138	34	75.3	8	94	132	12	91	10	92.4
3)	Arka	125	200	--60	42	66.4	124	48	61.25	26	79.3
4)	Devadāru	28	21	---25	1	96.4	23	18	21.7	5	78.3
5)	Dronasuspi	52	18	70.8	28	38.3	57	26	54.3	28	50.2
6)	Eranda	41	26	36.6	32	21.9	29	27	6.9	27	6.9
7)	Grandhi Tagara	30	19	36.6	18	40	37	7	81	16	56.8
8)	Sarsapa	32	9	72.7	6	82.7	36	10	72.2	6	83.3
9)	Satāvāri*	64	65	---1.5	31	51.5	53	46	13.2	39	54.3
10)	Sirisa*	28	30	---	21	25	22	17	22.7	8	63.6
				28.9							
11)	Vaca	58	31	47	36	38	89	18	79.78	16	82

*Enhanced Bacterial colony counts observed. Percentage indicates the reduction aerogenic microbial colonies.

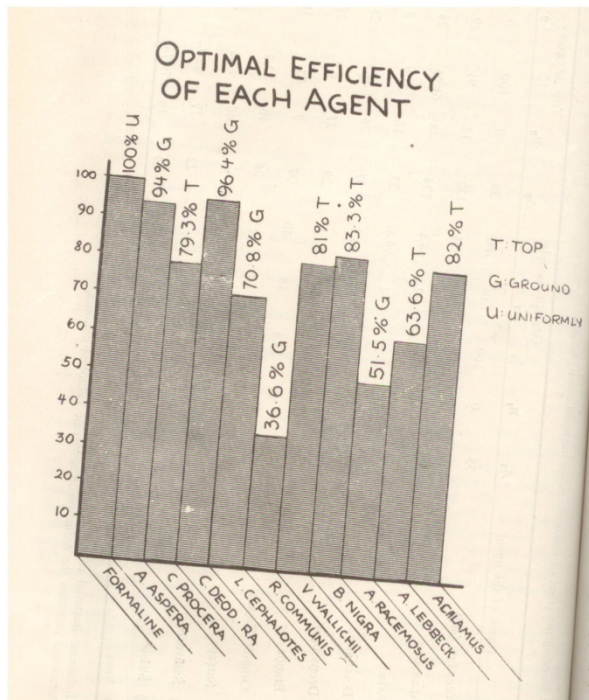


Table 11.: Showing the details of optimal efficiency of each material

S.NO	Name of the Agent	% Reduction*	Time taken	Site of sample
1)	Formalin	100	15min	Uniform
2)	APāmārga	94	45min	Ground samples
3)	Arka	79.3	45min	Top samples
4)	Devadāru	96.4	45min	Ground samples
5)	Dronapuspi	70.8	15min	Ground samples
6)	Eranda	36.6	15min	Ground samples
7)	Grandhi tagara	81	15min	Top samples
8)	Sarsapa	83.3	45min	Top samples
9)	Sātāvāri	51.5	45min	Ground samples
10)	Sirisa	63.6	45min	Top samples
11)	Vaca	82	45min	Top samples

*Percentage of Reduction in Aerogenic Bacterial colony counts.

Discussion

The comparative disinfectant, Formaline was used in this study, by standardised method. This method ensures an effective concentration in air, uniformly and by virtue of its high volatile nature, it destroys the aerogenic microbials completely. If the subjects were used by a crude methods of fumigation which might not ensure the requisite and uniform concentration in the area. Thus there were considerable variations in the percentage disinfection with each agent at ground and top samples.

In relation to Formaline, Devadāru (cedrus deodara) was found to be highly effective among all the other subjects. Optimal disinfection achieved by this subject was 96.4% and 78.3% for ground and top samples respectively. The plant was indicated for fumigation to prevent various diseases⁶ and is indicated to be highly rich in volatile matter which contain a Sesquiterpene⁷. In a study on cedrus oil it was found to be a potent anti-fungal⁸. However the low disinfection at top shows a lesser upward transmission of fumes.

Apāmārga (*Achyranthus aspera*) which was described in "Atharva veda" I was observed to propagate with better uniformity. Optimal disinfection was 94% and 92% for ground and top samples respectively. The seeds were reported to be rich in ash containing potash⁹. An aqueous extract from the leaves was observed to inhibit *staphylococcus aureus*.¹⁰

A highly proclaimed "raksoghadravya" Sarsapa 4,6 (*B. nigra*) was observed to affect aerogenic microbes with not much variation. A 72.7% and 72.2% disinfection was observed at ground and 82.7% and 83.3% were observed at top respectively during 1st and 2nd sampling. However, it did not show marked anti – bacterial effect "in – vitro" compared to "Streptomycin".

"Grandhi tagara" (*Valeriana wallichii*), fumigation of which has been indicated to prevent and cure various diseases and to evoke unconscious patients⁶, has shown its optimal disinfection at top samples initially (81%), but the effect was not observed to last

longer. The rhizome was reported to be rich in highly volatile matter containing Isovaleric acid. Former observation shows it's transient nature of disinfection.

In prevention and cure of Sepsis and various diseases Vaca (*Acorus calamus*) is proclaimed highly effective^{4,6}. The dry rhizome of the plant contains aromatic volatile oil⁹. Through the essential activity 'in – vitro' the drug has exhibited 82% and 79.78% of disinfection at ground and top samples respectively.

The flowers of another disinfectant "Dronapuspi" (*Leucas ecphalotes*) contain small quantity of essential oil¹⁶. After 15 minutes, the herb has disinfected at ground samples. This observation is in conformity with it's anti – microbial effect^{17,18}.

Three plants used in this study have shown an increase in the colony counts of ground samples; while showing a moderate disinfection (refer table-1). This interesting phenomenon was more marked with Arka (*Calotropis procera*), followed by Sirisa (*Albizia lebbek*) and "Satāvāri" (*Asperague racemosus*). A moderate antimicrobial effect was observed with this plant while it's optimal disinfected up to 63.4% in this study, was described to prevent various diseases⁶, while it was reported to be active against "Helminthosporium" Sativum²⁰. The third in this group, Satāvāri (*Asperague racemosus*) was cited in "Atharvaveda '1, and is reported to possess a combined anti – bacterial, Anti- tubercular and Anti – fungal activity²⁰. This interesting phenomenon observed with respect to these 3 plants is presumable due to downward settlement of aerogenic microbials, with air when fumes move upwards. Sedimenting organisms

were observed to be reduced in a consequent samples.

"Eranda" (*Ricinus communis*) has shown a poor disinfection in relation to Formalin, the optimal being only 36.6%. "In – vitro" studies were also not in favour of it's "Anti – microbial effect". 11,13

During the study it was a subjective observation that the fumigation with herbs were non – irritant.

Conclusion

The concept of 'Raksoghna karma' might be an ancient process of disinfection. Devadāru (*Cedrus deodara*; Roxb; aspera; Linn; Amaranthaceae), Sarsapa (*Brassica nigra*, Koch; Cruciferae), Vaca (*Acorus calamus*; Linn; Araceae) deserve further studies in this direction. By determining effective concentration, with uniformity, the optimal disinfection is achieved uniformly

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