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CONTROL OF AIRBORNE BACTERIA BY PERFORMING AGNIHOTRA

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ABSTRACT
Agnihotra is a traditional domestic solemnity, performed to maintain harmony between living beings and nature, without harming and by giving respect. Agnihotra, the simplest forms of Yajnya performed at sunset/ sunrise in which cow dung is burned in the copper pot by using cow ghee and brown rice as oblations along with chanting of mantras of sun and fire. To study the effect of fumes generated during Agnihotra on the airborne bacteria, the ambient air samples were collected by active as well as passive air sampling and the airborne bacteria were enumerated by plate count method. The bacterial count was taken before performing Agnihotra, during performance of Agnihotra and after the performance of Agnihotra, up to 40 feet apart from the source of Agnihotra. Our results revealed that the airborne bacterial count can be significantly decreased up to 99% that of initial count due the fumes generated after performance of the Agnihotra. Hence we can control the airborne bacteria by performing the Agnihotra.
KEY WORDS: *Agnihotra, Fumes, Airborne Bacteria, Active Air Sampling, Passive Air Sampling*

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INTRODUCTION

Agnihotra is a traditional domestic solemnity, performed to maintain harmony between living beings and nature, without harming and by giving respect. Agnihotra, the simplest forms of Yajnya performed at sunset/ sunrise in which cow dung is burned in the copper pot by using cow ghee and brown rice as oblations along with chanting of mantras of sun and fire. The fumes and ash of Agnihotra are useful to purify water and air, ameliorate agriculture, reduces the pathogenicity of microorganisms and help to improve the health of living beings. [1]

The hydrogen sulphide (H_2S) and nitric oxide (NO) are released due to cows' dung and ghee (hump-backed Indian cow) during yagnya process, both H_2S and NO act as bio-signalling (communication of cells with surrounding environment) molecule and involved in growing of new blood vessels, control of Alzheimers disease, etc. The cow butterfat is having various fat-soluble vitamins like A, D, E and K, which work as antioxidant, antiaging and anti-cholesterol. The pyramidal shape of copper pot has importance to generate, hoard and transmute energies during yagnya process. Also, copper is having oligodynamic action and is a good conductor of energy with antimicrobial properties. [2]

The Agnihotra is simplest form of fire based technique moving down from the ancient Vedic literatures. Agnihotra is the process of removing toxic state of affairs from the atmosphere through the various energies coming through fire, which has positive effects on ambient environment. The desired spiritual, physiochemical and biological behoofs of Agnihotra can be achieved through combination of heat energy engendered during burning of Agnihotra raw material and sound energy generated by chanting of mantras while performing Agnihotra. The evolution of energies may be due to the raw materials used while performing Agnihotra, which may be accountable for chemical changes in an ambient environment. [3]

The ash and fumes produced by the Agnihotra has ascribed with remedial properties. Fumes generated due to the Agnihotra controls the oxides of nitrogen, oxides of sulphur as well as microbial load in the ambient environment. [4, 5] By considering above mentioned articles, here in this article we have recorded the studies on the control of airborne bacteria by using fumes generated after performing Agnihotra.

MATERIALS AND METHODS

Agnihotra Procedure:

The 100 g of dried dung of *Gir* cow (*Bos (primigenius) indicus*) was lit in an inverted copper pyramid with specific dimensions (14.5 cm at top, 5.25 cm at bottom and 6.25 cm in height). The offerings of about 0.5 g

of brown rice with 2 mL of pure cow ghee were given at the time of sunrise/sunset by chanting of sunrise mantra: - "Suryaya swáahá| Suryáya idam na mama|| Prajápataye swáahá| Prajápataye idam na mama||" and sunset mantra: - "Agnaye swaáhá| Agnaye idam na mama|| Prajápataye swaáhá| Prajápataye idam na mama||" [3, 7].
To study effects of Agnihotra fumes on ambient bacteria, one h air sampling was done before Agnihotra, during Agnihotra and after Agnihotra by using Handy Air Sampler in respective absorbing media. Also air sampling was done 30 min before sunrise and sunset timings of Agnihotra and 0 feet, 10 feet, 20 feet, 30 feet and 40 feet apart from the source of Agnihotra. Microbial count of Active and Passive air sampling was done by plate count method as described below;

Bacterial count of air by passive air collection:

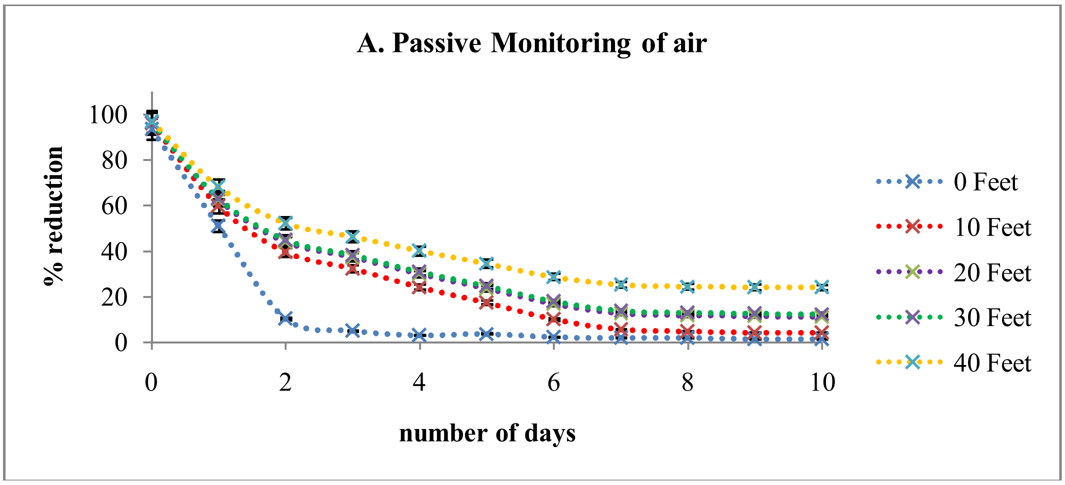
The passive air monitoring was done by using settle plate method [8]. In 100 cm^2 of petriplates containing sterile nutrient agar were opened and kept 1 m apart from ground for 10 min to settle microbes on it. The plates were incubated for 24 h at 37 °C and the bacterial count was expressed in terms of CFU/m^3 of air.

Bacterial count of air by active air collection:

The active air monitoring was done by using handy air sampler (Spectralab, HDS-8) to calculate bacterial count [8]. The surrounding air was impinged in 10 mL of sterile nutrient broth using specific flow rate. The bacterial count was taken by using serial dilution [9] of media (Nutrient Broth) and spread plate techniques [10]. Plates were incubated for 24 h at 37 °C and the bacterial count was expressed in terms of CFU/m^3 of ambient air.
Statistical analysis was done with IBM SPSS software and the variation of data is expressed in terms of the standard error of mean (Mean ± SE) along with the number of observations (n).

RESULTS AND DISCUSSION

It was evident from Tables 1 and Figure 1 that the results obtained by passive (Table 1A and Figure 1A) and active (Table 1B and Figure 1B) monitoring of ambient air for bacteria it was found that, bacterial count was significantly decreased up to 99% that of initial levels.
It has been observed by passive monitoring of air for bacteria that, the regular performance of Agnihotra for 10 days reduces the bacterial count up to 98.34%, 95.95%, 88.74%, 87.60% and 75.95% from the source of Agnihotra at 0 ft, 10 ft, 20 ft, 30 ft and 40 ft apart from the source of Agnihotra, respectively. Similarly, it has been observed by active monitoring of the air for bacteria that, the regular performance of Agnihotra for 10 days reduced the bacterial count up to 97.13%, 94.95%, 93.22%, 89.29% and 82.39% from the source of Agnihotra at 0 ft, 10 ft, 20 ft, 30 ft and 40 ft apart from the source of Agnihotra, respectively.
After performance of Agnihotra twice a day (during sunrise and sunset) for 10 days, the average bacterial count reduced up to 97.74%, 95.45%, 90.98%, 88.44% and 79.17% at the source of Agnihotra at 0 ft, 10 ft, 20 ft, 30 ft and 40 ft apart from the source of Agnihotra, respectively.
The various other forms of Yajnyas viz. Somyag Yajnya [11, 12], Shrisukta Yajnya [13] also showed reduction of airborne microbial count in the ambient environment. The previous studies [14, 15 and 16] showed similar findings like present study, where a considerable reduction in the bacterial count of an ambient air was observed. The various antimicrobial gases viz. formaldehyde, menthol, phenols, indols, ammonia, propylene and ethylene oxides, acetylene, propiolactone etc. got evolved through combustion of cow dung, brown rice with cows ghee during performance of Agnihotra. [17]



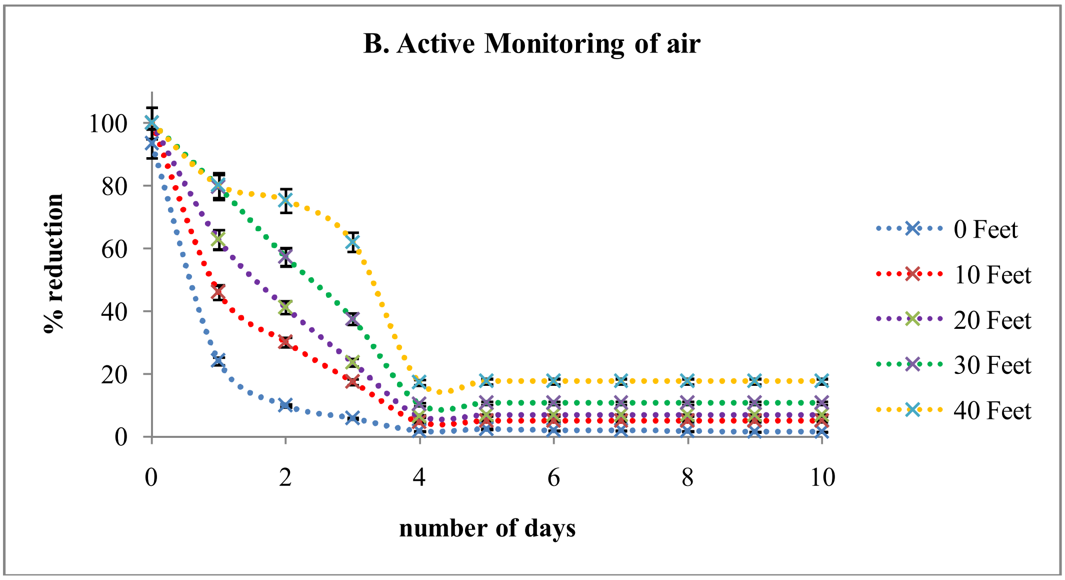


Figure 1: % reduction in microbial count with respect to time (in days) monitored by (A) passive and (B) active air sampling.

Table 1: Microbial count from 0 ft to 40 ft apart from source monitored by passive (A) and active (B) air sampling

A. Average microbial count (CFU/m³) in the passive air monitoring at										
Day	At source		10 ft apart		20 ft apart		30 ft apart		40 ft apart	
	M	E	M	E	M	E	M	E	M	E
-1	0.62 ± 0.14	0.50 ± 0.11	0.64 ± 0.14	0.51 ± 0.12	0.63 ± 0.14	0.50 ± 0.11	0.65 ± 0.15	0.52 ± 0.12	0.65 ± 0.15	0.52 ± 0.12
0	0.58 ± 0.13	0.46 ± 0.1	0.58 ± 0.13	0.47 ± 0.1	0.59 ± 0.13	0.47 ± 0.10	0.59 ± 0.13	0.47 ± 0.10	0.61 ± 0.13	0.49 ± 0.11
1	0.32 ± 0.09	0.25 ± 0.07	0.33 ± 0.09	0.29 ± 0.08	0.36 ± 0.10	0.33 ± 0.09	0.37 ± 0.10	0.38 ± 0.10	0.47 ± 0.13	0.50 ± 0.14
2	0.06 ± 0.00	0.05 ± 0.00	0.07 ± 0.00	0.05 ± 0.00	0.10 ± 0.00	0.07 ± 0.00	0.12 ± 0.00	0.08 ± 0.00	0.13 ± 0.00	0.14 ± 0.00
3	0.03 ± 0.00	0.02 ± 0.00	0.04 ± 0.00	0.03 ± 0.00	0.05 ± 0.00	0.04 ± 0.00	0.06 ± 0.00	0.05 ± 0.00	0.06 ± 0.00	0.07 ± 0.00
4	0.02 ± 0.01	0.02 ± 0.01	0.02 ± 0.00	0.02 ± 0.00	0.03 ± 0.00	0.03 ± 0.00	0.04 ± 0.00	0.03 ± 0.00	0.04 ± 0.01	0.04 ± 0.01
5	0.02 ± 0.00	0.02 ± 0.00	0.02 ± 0.00	0.01 ± 0.00	0.02 ± 0.00	0.01 ± 0.00	0.03 ± 0.00	0.02 ± 0.00	0.03 ± 0.00	0.06 ± 0.01
6	0.01 ± 0.00	0.01 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	0.02 ± 0.00	0.02 ± 0.00	0.02 ± 0.00	0.05 ± 0.01
7	0.01 ± 0.00	0.01 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	0.02 ± 0.00	0.02 ± 0.00	0.02 ± 0.00	0.05 ± 0.00
8	0.01 ± 0.00	0.01 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	0.02 ± 0.00	0.01 ± 0.00	0.02 ± 0.00	0.05 ± 0.00
9	0.01 ± 0.00	0.01 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	0.01 ± 0.00	0.01 ± 0.00	0.02 ± 0.00	0.04 ± 0.00
10	0.01 ± 0.00	0.01 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	0.01 ± 0.00	0.01 ± 0.00	0.02 ± 0.00	0.04 ± 0.00
B. Average microbial count (CFU/m³) in the active air monitoring at										
Day	At source		10 ft		20 ft		30 ft		40 ft	
	M	E	M	E	M	E	M	E	M	E
-1	7.15 ± 1.61	6.27 ± 1.42	5.62 ± 1.27	6.27 ± 1.42	4.51 ± 1.02	4.38 ± 0.99	3.85 ± 0.87	3.32 ± 0.75	2.79 ± 0.63	2.27 ± 0.51
0	6.68 ± 1.45	5.87 ± 1.27	5.25 ± 1.14	5.87 ± 1.27	4.22 ± 0.92	4.1 ± 0.89	3.6 ± 0.78	3.11 ± 0.68	2.61 ± 0.57	2.12 ± 0.46
1	1.51 ± 0.41	1.71 ± 0.47	2.28 ± 0.62	2.81 ± 0.77	2.27 ± 0.62	2.9 ± 0.79	3.17 ± 0.87	2.18 ± 0.59	2 ± 0.55	1.75 ± 0.48
2	0.63 ± 0.02	0.7 ± 0.02	0.94 ± 0.03	1.16 ± 0.04	0.94 ± 0.03	1.2 ± 0.04	1.3 ± 0.04	1.1 ± 0.03	1.11 ± 0.03	1.09 ± 0.03
3	0.36 ± 0.02	0.41 ± 0.03	0.54 ± 0.04	0.67 ± 0.04	0.54 ± 0.04	0.69 ± 0.04	0.75 ± 0.05	0.81 ± 0.05	0.88 ± 0.06	0.94 ± 0.06
4	0.11 ± 0.01	0.12 ± 0.02	0.16 ± 0.02	0.2 ± 0.03	0.17 ± 0.02	0.21 ± 0.03	0.23 ± 0.03	0.25 ± 0.03	0.27 ± 0.04	0.29 ± 0.04
5	0.15 ± 0.03	0.17 ± 0.03	0.23 ± 0.04	0.28 ± 0.05	0.22 ± 0.04	0.28 ± 0.05	0.31 ± 0.05	0.33 ± 0.06	0.36 ± 0.06	0.38 ± 0.07

6	0.13 ± 0.01	0.14 ± 0.02	0.19 ± 0.02	0.23 ± 0.03	0.18 ± 0.02	0.23 ± 0.03	0.25 ± 0.03	0.27 ± 0.03	0.29 ± 0.03	0.31 ± 0.04
7	0.12 ± 0.01	0.13 ± 0.01	0.18 ± 0.01	0.21 ± 0.02	0.17 ± 0.01	0.22 ± 0.02	0.24 ± 0.02	0.26 ± 0.02	0.28 ± 0.02	0.3 ± 0.02
8	0.11 ± 0.01	0.12 ± 0.01	0.17 ± 0.01	0.2 ± 0.01	0.16 ± 0.01	0.21 ± 0.01	0.23 ± 0.01	0.25 ± 0.01	0.26 ± 0.02	0.28 ± 0.02
9	0.10 ± 0.01	0.11 ± 0.01	0.15 ± 0.01	0.18 ± 0.01	0.14 ± 0.01	0.18 ± 0.01	0.20 ± 0.01	0.21 ± 0.01	0.23 ± 0.01	0.24 ± 0.01
10	0.10 ± 0.01	0.11 ± 0.01	0.15 ± 0.01	0.18 ± 0.01	0.14 ± 0.01	0.18 ± 0.01	0.2 ± 0.01	0.21 ± 0.01	0.23 ± 0.01	0.24 ± 0.01

Microbial count from source to 40 ft apart from source monitored by (A) passive and (B) active air sampling (expressed as Mean ± SE, n = 3). M and E represents monitoring of air before sunrise and sunset timings during Agnihotra experiments; -1 is a day before starting Agnihotra experiment; 0 is the starting day of Agnihotra experiment.

CONCLUSION

Thus present findings and that of previous work indicates that the airborne bacteria can be controlled by performing the Agnihotra. The control of airborne bacteria is due to the performance of Agnihotra twice a day (during sunrise and sunset) and it is effective few distance apart from the source. The airborne bacteria present in the ambient air may get dispersed or may get killed or may get inactivated due to releasing of various above mentioned gases while performing Agnihotra. As the fumes of Agnihotra can control the airborne bacteria, this research may applicable in hospitals, open areas, theaters, etc. Further research related to the composition of Agnihotra fumes and the mechanism of action for antimicrobial properties of Agnihotra fumes is needed.

CONFLICT OF INTEREST

The authors have no any conflict of interest

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