

Agnihotra – A Non Conventional Solution to Air Pollution

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Abstract—The present study entitled “Agnihotra-A Non conventional solution to air pollution” is completely based on laboratory work. Our main aim was to find out non conventional solution to air pollution by criteria pollutants like SO_x, NO_x, CO, RSPM, and SPM. We used very innovative ideas to reduce the concentration of criteria pollutants using Agnihotra. In this experimental work we have achieved a good level of treatment. We conducted yagya, using all the procedure guided by literature of Pandit Shri Ram Sharma Acharya, in laboratory and artificially generated pollution conditions. After taking 5-10 readings and studying all the different methodologies, using almost 324 Ahuties yagya with cow's desi ghee, Pipal wood (*Ficus religiosa*), Havan samagri a mixture of kapurkachari, gugal, nagarmotha, balchhaar or jatamansi, narkachura, sugandhbela, illayachi, jayphal, cloves and dalchini etc. We came across a conclusion that the air pollution of criteria pollutants can be effectively reduced opting column method using locally available materials and without adding any chemicals. Under the natural lab conditions and after creating local and artificial indoor air pollution it was noticed that SO_x, NO_x were considerably reduced by almost 51%, 60% respectively more by yagya when compared to those without yagya and both RSPM & SPM were also found to be reduced by 9% & 65% respectively more as compared to the condition without yagya. Although the RSPM & SPM concentrations were still there but not to the extent of unhygienic conditions. The odor and smell of the Havan hall was not at all objectionable.

The authors also have emphasized the importance of Agnihotra and how it purifies not only our atmosphere where from we breathe but also our soul, mind and body practicing everything sacrificed to Almighty Vishnu and thereby we all are blessed in return.

Key words: Yagya, Agnihotra, Acharya, Havan Samagri, Purohit, Aahutu. RSPM, SPM.



AGNIHOTRA

I. INTRODUCTION

One can live without food for some days, without water for some hours but cannot live without Pran- Vayu which is offered by our plants by its purification. Over greed and ambitions of accumulation

beyond need for generations to come, the man is severely damaging the plants and thereby polluting atmosphere directly or indirectly.

What pollutes our atmospheric air is nothing but a multitudinous phalanx of natural and manmade gaseous and volatile chemical effluents, emissions, aerosols and some resulting products of reactions occurring in atmosphere which all mix with ambient air and continuous release causes health hazards to all living beings. As far as in-house air pollution is concerned it may be due to burning smoke, building material dust, occupational and biological activities. Wood burning, kerosene as fuel for cooking and heating purposes produces huge amount of smoke, CO₂, CO, SPM, RSPM in small and suffocated houses usually in rural areas. Sometimes houses are air tight if there is frequent use of Air Conditioners and under this kind of circumstances in house air pollutants do not get dispersed in to the sink of open air posing serious threat to human health and so the indoor air pollution is also of greater concern. The indoor pollution is more disastrous as compared to that of outdoor pollution because of more exposure in close proximity. Acute Respiratory Infections (ARI), Chronic Pulmonary Disease like asthma and bronchitis, Lung cancer, pregnancy problems etc. are some of the main health problems which are common to occur in suffocated houses of rural areas.

Worldwide many cities are severely suffering from rusty and alarming air quality. According to the World Health Organization billions of urban habitants inhale the atmospheric ill air beyond WHO standards of air quality which is a serious issue and especially it becomes very very serious in case of developing countries like India; fighting with poverty, malnutrition, fundamental needs and lack of sanitation in rural areas. These countries also have to chase the targets of industrialization, urbanization and modernization for their development so it is like a challenge.

Air pollution of our ecosystem is one of the solemn problems affecting all living and non living beings and it can only be controlled at the source itself not at all by isolation or cleaning efforts. There are numerous kind of manmade, natural and industrial emissions which pollute our air we breathe (Joshi, R. 2001). Beyond prescribed limits the detrimental combination of NO₂, CO, SPM and RSPM, severely affects all living beings if inhaled. Huge amount of funds spent by governments on this issue without any positive outcome diverted the researchers towards this "Agnihotra, a non conventional solution to air pollution.

From Vedas we have come to know that Agnihotra also called Havan or Yagya is an ancient ceremonial of Aryans/Vedic culture and it purifies the air we breathe what is called the Pran-Vayu. Actually when Agnihotra is performed the warm, lighter and purified air goes up and replaces the heavier polluted air so this is how this ritual purifies our atmosphere. Though Wood burning produces smoke/gases but it also kills harmful microbes and mosquitoes. From ancient times the Indian villagers are using this cheap and effective technique to remove mosquitoes.

After a series of indoor experiments conducted by various researchers it has been investigated that mango wood without CO emission is the best fit wood to be used as Samidhas and Havan Samigri, a combination of odoriferous and medicinal herbs along with Cow's pure desi ghee can be used in Agnihotra to purify the atmospheric air. Agnihotra is very powerful process which controls the air pollution not only of gaseous and microbial kind but also it makes the environment clean and green without any ill smell. It releases pleasant smells of odorous medicinal herbs burning with cows desi ghee smoke. It has a very long lasting effect on atmosphere to purify it. So we are left now only with Agnihotra which may be only the solution to atmospheric pollution issue. Our fore fathers understood this ritual and its importance from Vedas and guided us to perform it in our daily life but today's generation has forgotten and therefore now it is the time to adopt this ritual in daily practice to make our environment clean, green and healthy for the sake of our future generations (Saxena, M. et al 2008)

Agnihotra and Gayatri Mantra are the roots of Indian rituals and Vedic culture. Gayatri Mantra is recited during Agnihotra with samidha and samigri where from cosmic energy of sound in the mantra gets activated and spreads in the universe to bless every one. (Joshi, R. 2001).

The four Vedas Rig, Sama, Yajur and Atharva of Sanatan or Vedic Indian culture explain the philosophy of the perpetuity and simultaneous role of Gayatri Mantra and Agnihotra. Rigveda is oldest and it tells about the knowledge through prayers one of which is Gayatri Mantra (Photo-6). The Sama veda is a collection of melodious mantras sung by the purohits in yagna such as Gayatri Mantra is recited during Havan. Yajur veda deals with rituals, knowledge principle and methods of Agnihotra i.e. how to perform it. Atharva deals with sound therapy of various veda mantras. Agnihotra is a psychical and sciential practice for the welfare of all living beings on Earth and its surroundings. (Ashok N. Raval, 1981, Joshi, R. 2001).

Actually the Agnihotra is nothing but an unselfish oblation for the noble intention of welfare all living beings on the globe. Agnihotra teaches us the art of living setting the society in harmony through getting rid of ego, selfishness, greed beyond needs and thinking of mankind, welfare of all. So it is must to perform by all every one human beings. Agnihotra also promotes life style and protects higher human values in society which is the foundation of humanity. The researchers have mentioned numerous kinds of Yagyas from the Shastras such as Seva yagya; for the service of society, Gyana yagya; for the service of people for their knowledge and education, Prana yagya; for saving lives of people and inspiring them to live honestly and with self respect etc. Physically Ygya is the extraction, refinement and scattering of the subtle energy of matter converting it in to the nano particles using heat energy and sound energy of mantras. The intellectuality of this Indian philosophy of Agnihotra is very important like other sciences. It is just experimenting of the science of spirituality. (Joshi, R. 2001).

II. LITERATURE REVIEW

As per Indian scenario traditional biomass fuel consumption in rural areas is up to 80% which pollutes in house air mixed with smoke containing toxic pollutants such as CO, oxides of nitrogen (NOx), oxides of sulphur (SO_x), aldehydes, dioxins, polycyclic aromatic hydrocarbons, SPM and RSPM. The close proximity and long exposure threatens the human health as the indoor pollution exceeds the permissible norms (Saxena, M. et al, 2007, 2008).

Nautiyal, CS et al, (2007) analyzed and validated this ritual where medicinal herbs smoke reduced 94% of bacterial count within an hour and even continued up to 24 hours later in closed room. They also proved the disinfection and bactericidal potential of odoriferous havan samigri killing various pathogenic bacteria like Corynebacterium urealyticum, Curtobacterium flaccumfaciens, Enterobacter aerogenes, Kocuria rosea, Pseudomonas syringae pv. Persicae, Staphylococcus lentus etc in open air even after 30 days. The researchers have demonstrated that the diverse plants and human pathogenic bacteria of the atmospheric air can be completely dislodged.

Saxena, M. et al, (2007) studied the long lasting effect of Agnihotra with respect to odor, air microflora and gaseous pollutants such as NO₂, SO₂ and RSPM and observed nice smelling odor lasting next day, meaningful killing of pathogens, bacteria, fungi etc. even up to a week longer indicating Agnihotras could be used for disinfection purposes and sterilization too. For gaseous pollution control study in open air the same group of researchers conducted studies on the samples collected by CPCB and observed the outcomes very exciting with 40% decrease in NO₂ same day and 60% decrease next day and similar positive outcomes were in reduction of SO₂ as 86% same day and 100 % next day (Experiment conducted under Central Pollution Control Board, Delhi).

Saxena, M. et al, (2007) have reported burning incidents of air pollution of 20th century in which poor ambient air quality was the root cause of thousands of deaths. The researchers have talked of the 1948 'Killer Fog at Donara town, Pennsylvania in which 50 people killed and 1952 'London Fog' due to prevailing use of adulterated fuels where 4000 habitants killed. Many countries afterwards laid down air quality standards for the safety of their citizens with respect to some air pollutants like SO₂, SPM, NO₂, CO and Pb etc. which are released after combustion of fossil fuels. Though there is substantial reduction in pollution levels in many cities worldwide due to heavy funds allocation by their governments yet there

is an urgent need to think over this issue of poor air quality as far as industrialization worldwide is concerned.

As per ESMAP, World Bank 2000 report traditional biomass smoke causes problems related to acute respiratory infection such as chest infection, colds, coughs, and ENT infections. The authors have quoted the example of Gambia Island where mothers carry their children on their back during stove cooking and the children inhale all the pollutants in smoke and this way these children may be affected by Acute Respiratory Infections (ARI). In Tanzania children below five years die of throat infections as they sleep in a room cum kitchen with cook stove. In India and Nepal non-smoking women cooking with biomass stove exhibit asthma and chronic bronchitis as these women and their two year old children usually spend many hours near fire in houses. As per study the report says that in western India stillbirths increase by 50% if mothers continuously exposed to biomass stoves during throughout their pregnancy. Considerable amount of carbon monoxide was detected in such biomass stove exposed pregnant women. In addition to the above diseases indoor air pollution also causes blindness, immune system disorders.

Indoor air pollution in Indian scenario is due to the burning of bio fuels like wood, agricultural wastes and dried animal dung cakes in traditional Indian stoves called ‘Chulhas and Barosi’ in North India. It is the largest source of the emission of black carbon specially in rural areas and it is almost of the amount 42% of the total black carbon emission of India. Similar to that of China urbanization, industrial & auto emissions and coal base thermal power plants contribute a lot in outdoor pollution. (Venkataraman, et al., 2005).

During winter seasons there remains a thick fog for days and weeks in the vicinity of Delhi and Bangladesh. It extends from foot hills where there are reversal temperatures and colder and heavier air goes down uplifting warm air at plains. The so called mechanism traps smokes of burning of agricultural wastes cooling it near the cities and farms at ground. The agricultural waste burning has been identified specially in Punjab and West Bengal. There are so many images of air pollution at internet clicked by NASA.

Agnihotra Purohit Acharya Pt. Shri Netra Pal Sharma (Photo-3) explained Yajna Mahima referring Bhagvada Gita chapter-3 of ‘Karma-Yoga’ where the importance of the Agnihotra has been mentioned through shlokas 10,11,12,13 and 14. It says that performing Agnihotra must be a duty of every one without performing Agnihotra the food eaten is almost like a sin. It has been mentioned in Gita that in the beginning of creation, the almighty lord sent forth generations of men and demigods, along with sacrifices for Visnu, and blessed them “Be thou happy by this Yajna (sacrifice) because its performance will bestow upon you everything desirable for living happily and achieving liberation” (Gitopnishad, “Bhagavad-Gita, as it is”, Text-10, Chapter-3 Karm-Yoga, 2011). The demigods pleased with sacrifices also please us in return and this way prosperity will reign for all” says Gitopnishad, “Bhagavad-Gita, as it is, Text-11, Chapter-3 Karm-Yoga, 2011). Incharge of all needs, i.e. the demigods satisfied by the performance of Yajna supply all our needs to us. Those who enjoy these gifts without offering demigods in return is surely a thief (Gitopnishad, “Bhagavad-Gita, as it is”, Text-12, Chapter-3 Karm-Yoga, 2011). The Yajman or devotees get rid all kinds of their sins as they eat food first offered to demigods for sacrifice. While others who cook their food for self or personal sense enjoyment, verily eat sins only (Gitopnishad, “Bhagavad-Gita, as it is”, Text-13, Chapter-3 Karm-Yoga, 2011). All living beings survive on food grains produced by rains and the rains are precipitated by performing Yajna, the sacrifice only, and the Yajna is the result of prescribed duties (Gitopnishad, “Bhagavad-Gita, as it is”, Text-14, Chapter-3 Karm-Yoga, 2011). So the Agnihotra is a great sacrifice for the welfare of all living beings on this earth and the atmosphere.

Table-1 Annual deaths due to Air Pollution in Urban and Rural areas

<i>Region</i>	<i>Urban Outdoors</i>	<i>Urban Indoors</i>	<i>Rural Indoors</i>	<i>Total</i>
<i>Developed Countries</i>	14 (0.5)	252 (8.4)	28 (0.9)	294 (9.8)
<i>Developing Countries</i>	186 (6.2)	644 (21.5)	1876 (62.5)	2706 (90.2)
<i>Total</i>	200 (6.7)	896 (29.9)	1904 (63.5)	3000 (100)

Source: Report of the Committee on Environment and Health (MOEF), May 2000, (Courtesy Saxena, M.2007)

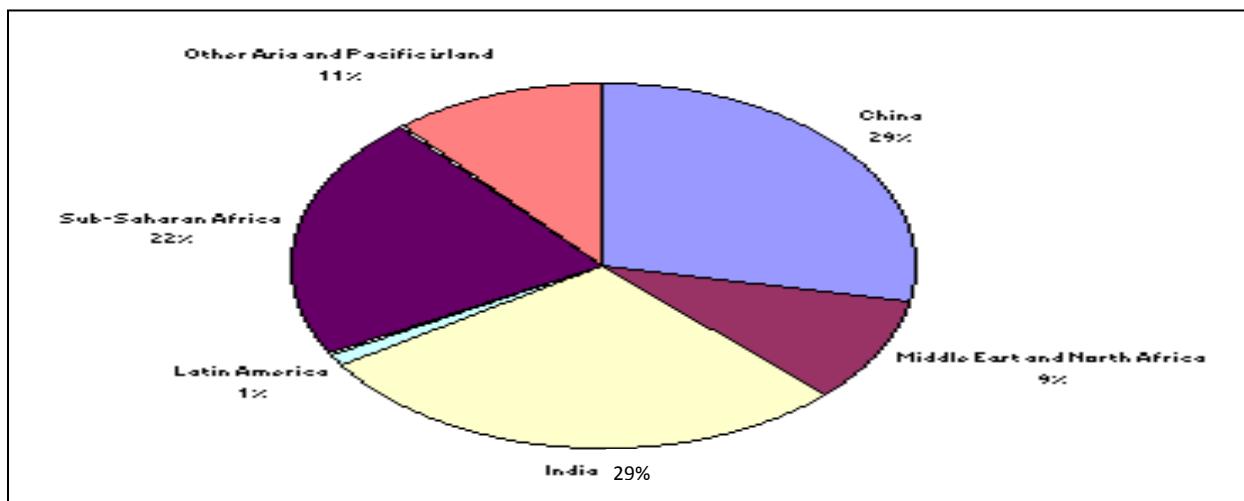


Figure-1 Death due to Indoor Air Pollution in the Developing World

Source: Indoor Air Quality, ESMAP, World Bank, September 2000 (Courtesy Saxena, M.2007)

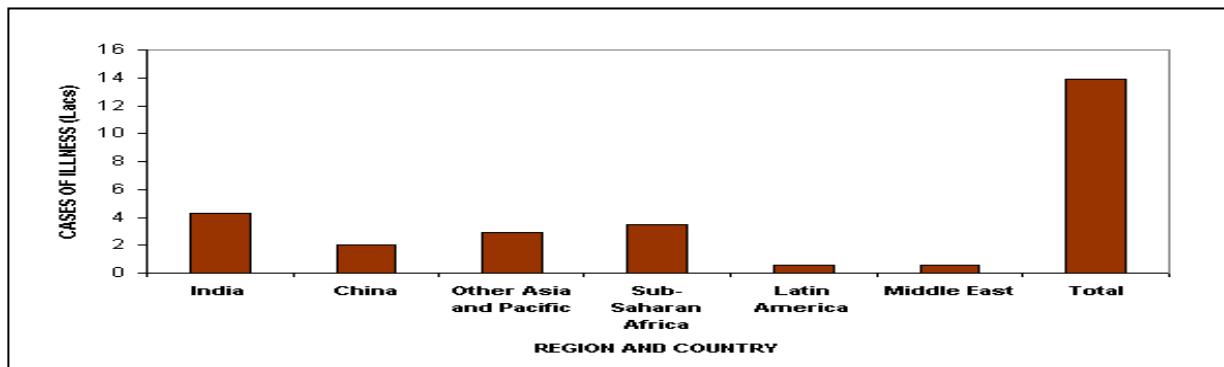


Figure 2 Burden of Disease from solid fuel use

Source: Indoor Air Quality, ESMAP, World Bank, 2000 (Courtesy Saxena, M.2007)

III. CRITERIA POLLUTANTS

The six basic and common pollutants which usually pollute our ambient air across the nation are particulate matter, carbon mono oxide, ground level ozone, oxides of sulfur, oxides of nitrogen and lead which are called ‘Criteria Pollutants’. These air pollutants are the real threats to the human health, environment and the property as well. The Air Prevention and Control of Pollution (APCP) act 1981 required Ministry Of Environment and Forest (MOEF) for setting National Ambient Air Quality Standards for these criteria pollutants. Environmental Protection Agency (EPA) regulates them by human health/environmental based criteria to set the permissible limits which are called Primary and Secondary Standards respectively.

How these criteria pollutants adversely affect human beings is discussed here taking one by one. The particulate matter PM₁₀ or RSPM induces heart attacks and many respiratory problems like asthma, chronic bronchitis, pulmonary emphysema. The Carbon Monoxide (CO) causes reduction in alertness and working efficiency, sounds in ears, cephalgia, vertigo, vomiting, inhaling problems, insomnia, coma conditions if inhaled more which can even lead to an end of life. Ground level ozone damages lungs, mental response, nasal tissue lining, immune system, inhaling and exhaling capacities. Oxides of sulfur (SO_X) provokes lung and heart diseases and cancer. It can also damage respiratory system. Oxides of Nitrogen (NO_X) cause various kinds of infections such as viral infection, lung irritation and infections, respiratory infections, chest infections and discomfort, irritation in eyes and headache. Lead (Pb) damages Kidney, Reproductive system, Nervous systems etc. Source: (central pollution control board, Delhi)

Location of Agnihotra:

The study was performed conducting Agnihotras intermittently at the Laboratory of Hindustan College Of science and Technology, NH-2, Farah, Mathura U.P., India, which is situated at a distance of 28 km from Mathura, Up, India.

IV. MATERIALS AND METHODS

As per “The Integrated Science of Yagya” by Pt. Shri Ram Sharma Acharya, 2001, the Agnihotra fire is a purely scientific method of sublimation of various fumigating substances such as pipal wood, aromatics, health ingredients, medicinal herbs with fire converting into energy and spreading its feasible and blissful impacts in the environment. The electromagnetic waves so produced carry the wished sound signals inbuilt in Veda Mantras recited by Purohits and Yajman in Agnihotra with ahuti of the arranged fumigating substances in the fire (Joshi, R. 2001). ▲

Before going to various phases of Agnihotra it becomes mandatory to know about the fumigating substances to arrange before the Agnihotra starts. Usually Yajman (one who performs Agnihotra) either gets these substances noted down from the Yagya Purohits (Skilled Acharya who directs Agnihotra how to proceed) or from the traditional departmental stores. The Integrated Science of Yagya has mentioned various fumigating substances to be arranged before and to be offered in Agnihotra so as to follow the right procedure to perform Yagya and get most benefitted. These materials are as follows and shown in Photo-2 and 3.

Samidhas

Well dried, dust, worms and insects free small wood sticks as per the size of Havankunda. The wood recommended for Samidhas purpose are as: Pipal-wood (*Ficus religiosa*), Mango-wood (*Mangifera indica*), Sandal-wood (*Santalum album*), Agar and Tagar wood (*Aquilaria malaccensis* and

Valeriana wallchii), Deodar (Cedrys libani), Palash (Butea frondosa), Bilva (Aegle marmelos), Bargad (Ficus bengalensis), Shami (Proposis spicigera), Gular (Ficus glomerata).

Havan Samigri

It comprises of the four ingredients such as sugandh (aromatics), Swasthya vardhak (health components), madhu (sweets) and ayush/aushdhiya jade-bootee (medicative herbs). As per availability and choice these havan samigri ingredients can be chosen. Acharya Pt. Shree Ram Sharma has explained in detail as follows. Saffron, musk, agar, tagar, chandan, illaychi, jayphal, javitri and camphor fall under the category of Aromatics. Cow's pure desi ghee, milk, fruits and cereals such as wheat, rice, barley, til, kangu, munga, chana, arhar, masur or peas fall under health ingredients. Sugar, dried grapes, honey, batasa, milk rice (kheer), and chhuhara etc. come in the category of sweets. Somalata or Giloya, Brahmi, Shankhpushpi, Nagkesar, Mulhati, Red Chandan, Baheda, Sonth and Harad fall under the category of medicinal herbs. Arya Samaj kendras also distribute this samigri of standard norms. Today many companies have come forward to sale readymade Havan samagri in the market but it varies as per constituents and cost. Most of the readymade Samigris in the market contain sandal or mango or pine-wood saw dust and agar/tagar chips, kapurkachari, gugal, nagarmotha, balchhaar or jatamansi, narkachura, sugandhbala, illayachi, jayphal, cloves and dalchini (Photo-2 & 5).

During Agnihotra wood burning process, the chemical products cannot be explained because of varying characteristics of ingredients used in samigri as there is lot of choice of samigri available in the market. The nature of products of combustion depend on the materials used in samigri and obviously the temperature, flames, air access, chemical reactions of the products. Instead of complete combustion of wood cellulose there is vaporization because of samidhas arrangement in havan kund to control the air access. The pleasing smell of Agnihotra can be experienced even at distant places because odorous flames reach at higher altitudes and spread in atmosphere. The enormous amount of smoke along with steam also acts as a cloud of colloidal providing enough surface area for the mechanical diffusion of volatile aromatic ingredients depending on the prevailing wind, humidity and temperature.

Cow's desi ghee and vegetables are some fatty substances which are used in ahutis of Agnihotra. Ghee supports fire flames causing rapid combustion of wood cellulose and thereby all fatty substances easily go fly up in air. Glycerol after combustion produces acetone tiny particles, pyruvic aldehyde and glyoxal etc. The hydrocarbon so produced later undergoes slow combustion and finally results alcohols, aldehydes and acids. All the above diffused volatile substances in atmosphere are affected photo chemical reactions if Agnihotra is performed in sun light in the range of ultra-violet and short wave lengths as follows:



The reaction shows that atmospheric carbon di oxide also reduces to formaldehyde and oxygen is released (Joshi, R. 2001).

Agnihotra Kund

The special reverse pyramid type Havan Kund is used so as to achieve controlled and multidimensional dissipated energy. As the name indicates 'pyramid' meaning the heat or fire in middle. It works as the source of spiritual energy which is scattered in all the directions of atmosphere in surroundings. For bigger occasions it is constructed by bricks plastered by cow dung but for daily practice of Agnihotra which is called Balivaishva Yagya, a copper kund of desired size may be used as per requirement of number of members performing the Agnihotra. Cow dung and copper both are effective bacteriostatic and antimicrobial in nature and act as disinfectant. In connection with cosmic energy fields the size of copper kund has been recommended as 145 mm X 145 mm at top and 52.5 mm X 52.5 mm at bottom within a vertical height of 65 mm in three steps following inverted pyramid shape but it can be proportionally altered as per requirements of number of users, Yagyas and the type of occasion/functions (Joshi, R. 2001).

Veda Mantras Recitation

The chanting of Veda Mantras during Agnihotra causes sound vibrations which enters the minute and cosmic level energy spheres. Veda Mantras have specific inbuilt vibrational powers to create harmonious wave patterns if pronounced correctly. The recitation of Gayatri Mantra (Photo-6) during Agnihotra is supplementary and spreads soothing vibrations of life sustaining energies for all kinds of living beings. Gayatri Mantra is the core and most important Veda Mantra to be chanted during Agnihotra repeatedly in most of the offerings to agni (aahutis).

V. SOLUTION TO AIR POLLUTION?

The modernization or advanced human activities like industrialization, urbanization, deforestation have created the ecological imbalance with respect to the soil, water, air, ozone layer, radiations etc. and has threatened all kinds of life as a whole on earth. The severe pollution of our atmosphere is causing various kinds of diseases in various organs of our body. Ozone layer depletion is also causing various kinds of skin diseases and reducing immunity. Bacterial and viral infections are also increasing day by day and these have developed resistance against drugs. Various researchers have proved that physical ailments have been found reduced in those houses where daily Agnihotra is performed. The nutritional, purity and medicinal powers of Agnihotra to purify the atmosphere have also been proved. The Agnihotra rejuvenates brain cells, skin and purifies blood in addition to the pathogen prevention. Agnihotra is a symbiotic healing process in which atmosphere is healed first and then in return atmosphere heals all living beings on earth. The constituent electrons of substances under fumigation purifies our atmosphere and this is well proved by many researchers.

“mixing ghee and sugar and burning them creates smoke which kills the germs of certain diseases and secretion takes place from some glands relate to the wind-pipe, which fill our heart and mind with pleasure” says Dr. Hafkine.

“Sugars present in *Havishya* have great power to purify the atmosphere. It kills the germs of T.B., measles, smallpox and cow-pox remarks” Prof. Tilward says.

“Cow’s milk contains great power of protection from atomic radiation; Houses having cow-dung covered floors enjoy complete protection from atomic radiation and If cow’s ghee is put into *Yagya* fire, its fumes reduce the effect of atomic radiation to a great extent” Dr. Shirowich says.

The medicinal herbs fumes emerging from Agnihotra have been found microbiologically bactericidal character and thereby they reduce ailments due to bacteria. So the Agnihotra this way purifies air (Ashwamedha Yagna 1996).

Aroma

In the surroundings of the Agnihotra venue the fumes of various aromatic substances such as thymol, eugenol, pine, terpinol, camphor, clove and sandal wood diffuse in atmosphere with steam and smoke too. The foul odors are replaced by these pleasing and soothing smell soon and lasts long time after Agnihotra.

Disinfection

During Agnihotra rapid combustion of various organic substances and hydrocarbons form formaldehyde which is used as a strong antiseptic and germicidal with steams and water vapours of Agnihotra. Usually people spray formaldehydes on the corners, ceilings and walls for disinfection purposes but Agnihotra forms fumes of formaldehyde which automatically get attached to each and every corner of our houses where havan is performed and that is why after Agnihotra, most of the Purohits instruct Yajman to spread these fumes in all the places of house for disinfection purposes. Hydrocarbons after getting oxidized produce formic acids and acetic acids which also act as disinfectants and are usually sprayed over fruits and vinegar respectively for their preservation. Madhukar, P. Giak-wad, (1995) conducted some experiments on rabbits and mice and found the Agnihotra fumes very strong antiseptic and antibiotic in nature. The Indian farmers spray the havan ash on the vegetables and other crops as disinfectant. Indians also use this havan ash for filtration of water to make it potable (Madhukar P.Giak-wad, 1995).

Insecticidal and Pesticidal

Agnihotra fumes act as strong insecticide and pesticide as a result many non-bacterial parasites like fleas, lice, ring worms, flies, bedbugs, and cockroach etc. harmful to other living beings are either get killed or ran away by these fumes. The house where Agnihotra is performed becomes all kinds of insects and pests free. Today these insects and pests have developed resistant to usual chemical reagents which are sprayed in houses and not the parasites but human health and animal health is being affected as a side effect. So we are left with Agnihotra's fumes, the only solution to kill or out away insects and pests parasites from our houses without any side effects. (Nautiyal 2007).

Agriculture

The Agnihotra fume's action of disinfection is also very useful for the plants and crops to make them healthy and free of bacteria, germs, pests and insects. Formaldehyde released in air falls back to the crops with precipitation and is well sprayed on the plants. The Agnihotra ash is also sprayed for the same purpose and this kind of farming is also called Agnihotra farming where big Agnihotra are performed in open air in the farms and agricultural fields. In Agnihotra farming ecological balance is achieved and crops and plants grow in pure atmosphere if Agnihotra are performed in the middle of the fields. Ash can be used as not only the fertilizer but also as safe disinfectant and insecticide. So the Agnihotra is a holistic approach towards cleaner and greener environment (Joshi, R. 2001).

Green House Effect!

It has always been a matter of discussion that wood and other organic burning in Agnihotra produces Carbon monoxide and Carbon dioxide causing green house effect but the way in which Samidhas and Havishya are arranged in havan kund and burnt it under goes the slow combustion at higher temperature which consumes a few amount of oxygen and proportionally a very amount of Carbon dioxide is released in to the sink of atmosphere where there is a least harm to the environment. Actually whatever carbon dioxide is released in to the atmosphere hand to hand it is absorbed by surrounding green vegetation and thereby strengthening Carbon dioxide cycle (Ashwamwdha Yagna 1996). The type of Carbon dioxide produced in Agnihotra is not a free carbon dioxide all times. It is mixed with other aromatic oils, antiseptic and antibiotic and these fruitful products are carried away to the distant places in surroundings.

The soothing aromatic Carbon dioxide produced in Agnihotra heals our mind and cures various kinds of mental disorders. It acts as a stimulant to those affected by improper ventilation in medicals worldwide. Radiations effect can also be reduced by Agnihotra's flames and residue. With P.S.I techniques Dr. L. Maela Anatoniowska from Poland has found that Agnihotra residue and flme eliminates radition effects (Joshi, R. 2001).

VI. METHODOLOGY

Air samples were analyzed in initial conditions, after generating artificial pollution and after performing Agnihotra. The artificial pollution was created by burning of following materials in weighed amounts as per given in following Table 3.

Table-3 Materials and Quantities for artificial pollution.

S. No.	Material	Quantity in Kg
1	Wooden powder (burada)	0.345
2	Wood coal	0.940
3	Hard coal	0.990
4	Tyre	0.440
5	Poly bags	0.400

6	Cow dung cakes	1.700
7	Mixture of (sodium potassium)	0.090

Agnihotra was performed under the supervision of Tapo Bhoomi Mathura, Gayatri Pariwar and the materials like Pipal wood (*Ficus religiosa*), Cow's desi ghee, Sweets, sugar, dried grapes, Havishya:- Somalata or Giloya, Brahmi, Shankhpushpi, Nagkesar, Mulhati, Red Chandan, Baheda, Sonth and Harad kapurkachari, gugal, nagarmotha, balchhaar or jatamansi, narkachura sugandhbala, illayachi, jayphal, cloves and dalchini were offered to Agnihotra flames.

Sampling of air pollutants

For SOx analysis TCM solution is used as absorbent

Absorbing solution:- SOx from air is absorbed in a solution of potassium tetra chloromercurate (TCM) Formation dissolve 10.86gm mercuric chloride in 1 liter of volumetric flask, add 0.066 gm EDTA, add 6.0 gm potassium chloride / sodium chloride [4.68gm] make up to one liter volume. The pH of this reagent is 4-5.

For NOx analysis NaOH solution is used as absorbent Absorbing solution 1gm NaOH and 0.25gm Sodium Arsenite In 250 ml solution.

OBSERVATIONS & GRAPHS:

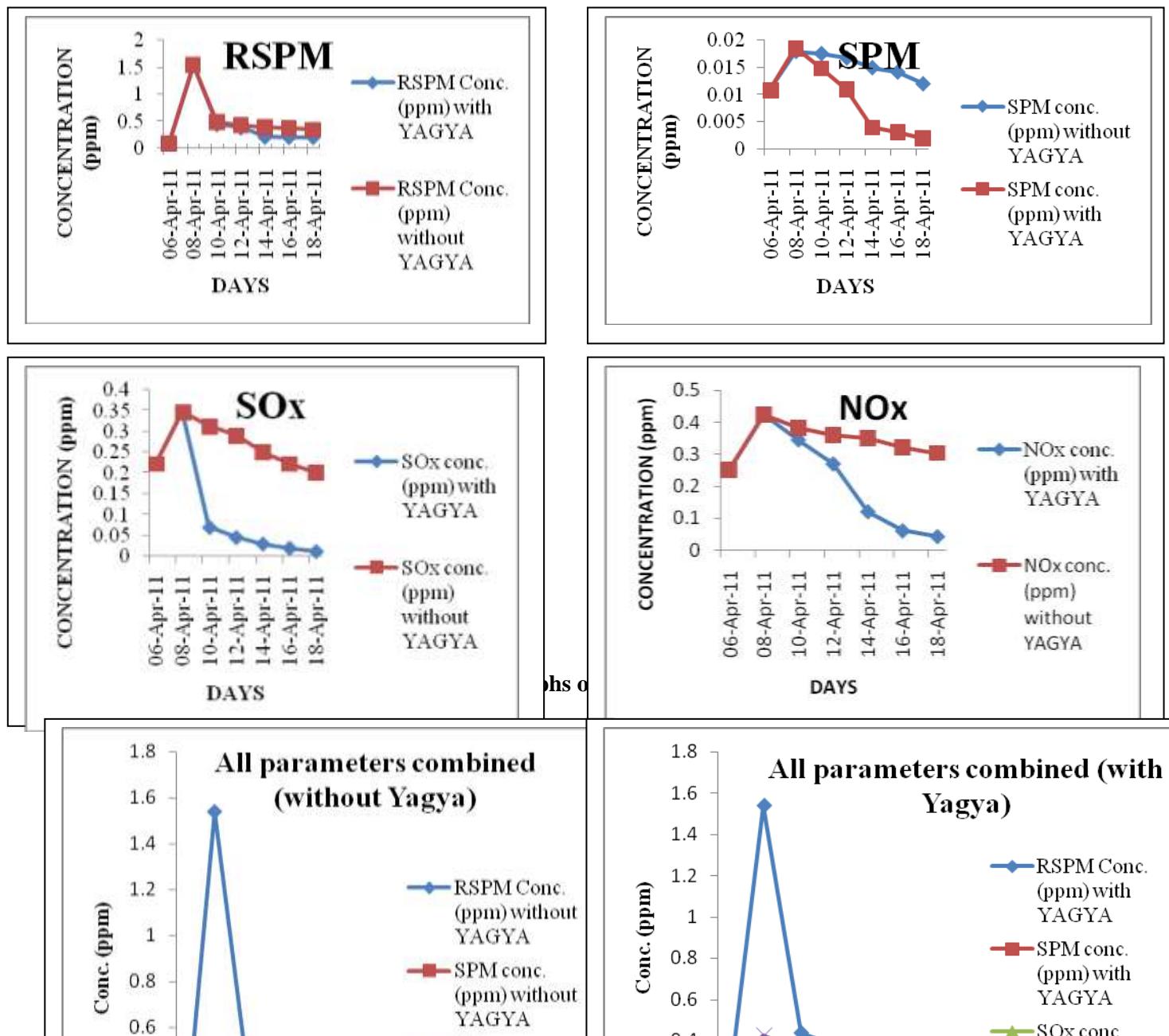


Table-4. Parameters temp, humidity, etc, during sampling

Date	Temperature in Celsius	Relative humidity in %	Sampling time	Timing	Sp. Humidity
6-apr-2011	24	17.5	14 hour	6pm to 8am	0.0045
8-apr-2011	26	30	14 hour	6pm to 8am	0.0092
10-apr-2011	25	19	14 hour	6pm to 8am	0.0052
12-apr-2011	30	40	14 hour	6pm to 8am	0.0106
14-apr-2011	28	36	14 hour	6pm to 8am	0.0101
16-apr-2011	29	34	14 hour	6pm to 8am	0.0096
18-apr-2011	30	30	14 hour	6pm to 8am	0.0092

Table-5. Observation table for RSPM and SPM.(with Yagya)

RSPM				SPM		
Date	Initial wt of paper (gm)	Final wt. of paper (gm)	Difference (gm)	Initial wt of paper (gm)	Final wt. of paper (gm)	Difference (gm)
6-apr-2011	2.8690	2.9505	0.0815	10.2326	10.2435	0.0109
8-apr-2011	2.6938	4.2340	1.5402	10.2350	10.2536	0.0179
10-apr-2011	2.6945	3.1320	0.4375	10.2378	10.2527	0.0110
12-apr-2011	2.6528	3.0296	0.3768	10.2312	10.2422	0.0149
14-apr-2011	2.6965	2.9016	0.2051	10.2364	10.2404	0.0040
16-apr-2011	2.6233	2.8234	0.2001	10.2355	10.2387	0.0032
18-apr-2011	2.8532	3.0523	0.1991	10.2310	10.2330	.00020

Table-6. Observation table for RSPM and SPM.(without Yagya)

RSPM				SPM		
Date	Initial wt of paper (gm)	Final wt. of paper (gm)	Difference (gm)	Initial wt of paper (gm)	Final wt. of paper (gm)	Difference (gm)
6-apr-2011	2.8690	2.9505	0.0815	10.2326	10.2435	0.0109
8-apr-2011	2.6938	4.2340	1.5402	10.2350	10.2537	0.0180
10-apr-2011	2.6940	3.1740	0.4800	10.2350	10.2526	0.0176
12-apr-2011	2.6932	3.1134	0.4202	10.2300	10.2468	0.0168
14-apr-2011	2.6820	3.0682	0.3862	10.2420	10.2570	0.0150
16-apr-2011	2.6832	3.0492	0.3660	10.2310	10.2452	0.0142
18-apr-2011	2.7502	3.0922	0.3420	10.2220	10.2320	0.0120

VII. CONCLUSION:

Under the natural lab conditions and after creating local and artificial indoor air pollution it was noticed that Sox, Nox were considerably reduced by almost 51%, 60% respectively more by yagya when compared without yagya and both RSPM & SPM were also found to be reduced by 9% & 65% more respectively as compared to the condition without yagya. Although the RSPM & SPM concentrations were still there but not to the extent of unhygienic conditions. The odor and smell of the Havan hall was not at all objectionable.

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REFERENCES

1. C. Venkataraman , G. Habib, A. Eiguren-Fernandez, A. H. Miguel and S. K. Friedlander; "Residential Biofuels in South Asia: Carbonaceous Aerosol Emissions and Climate Impacts" *Science* 4 March 2005: Vol. 307 no. 5714 pp. 1454-1456
2. "Adhunik Paryavaran Samasya- Vedic Samadhan", Compiled and edited by Swami Vivekanand Saraswati, Sw. Samarpananand Vedic Shodh Sansthan, Meerut, 1993.
3. "The Integrated Science of Yagya" by Pt. Shri Ram Sharma Acharya and Compiled By Dr. Rajani R. Joshi, Indian Institute of Technology, Bombay 2001 Publisher: Shantikunj, Haridwar(U.A), India, 249411.
4. "Agnihotra Studies- Findings", Agnihotraindia.com & CPCB
5. "Akhand Jyoti", Akhand Jyoti Sansthan, Mathura, Sept. '97 p.22
6. Akhand Jyoti, "The Devine Light, Jan-Feb, 2003", Akhand Jyoti Sansthan, Mathura.
7. Dr. Satya Prakash (1937): Agnihotra – "A Study From The Chemical Stand Point", Sarva Deshik Arya Pratinidhi Sabha, Delhi.
8. Gitopnishad, (Bhagavad-Gita, As it is) by A.C. Bhaktivedanta Swami Prabhupada. (2011). "Karm-Yoga" *The Bhakti Vedanta Book Trust, Hare Krishna Land, Juhu, Mumbai, India*, , Chapter-3, Text 10, 11,12, 13, 14.PP. 155-161.
9. K. Dwivedi et. Al (ETESE-2009) "Implementation of Wet Scrubbers for minimizing air pollution at Benara Castings – AGRA" International Conference on Emerging Technologies in Environmental Science and Engineering, Aligarh Muslim University, Aligarh, India, October 26–28, 2009, pp 509-517.
10. Saxena, M., Gupta, B.S., Pandya P. (2007) "A Study of the Impact of Yagya on Indoor microbial Enironents" *Indian Journal of Air Pollution Control*, Vol. VII No.1 March, 2007 pp 6-15.
11. Saxena, M., Gupta, B.S., Pandya P. (2007) "Effect of Yagya on the Gaseous Pollutants" *Indian Journal of Air Pollution Control*, Vol. VII No.2 September, 2007 pp 11-15.

12. Saxena, M., Gupta, B.S., Pandya P. and Srivastava, M. (2008) "Controlling the Microflora in Outdoor Environment: Effect of Yagna" *Indian Journal of Air Pollution Control*, Vol. VIII No.2 September, 2008 pp 30-36.

13. Nautiyal , C.S., Chauhan, P.S. and Nene, Y.L., (2007) "Medicinal smoke reduces airborne bacteria" *Journal of Ethnopharmacology*, Volume 114, Issue 3, 3 December 2007, Pages 446-451. doi:10.1016/j.jep.2007.08.038

14. 'Yagna's Scientific Interpretation' --- article published in the proceedings of *Ashwamedha Yagna* held in Montreal, Canada (26 to 28 July, 1996).

15. 'Does Yagna Add to the Prevalent Pollution?' --- Article published in the proceedings of *Ashwamedha Yagna* held in Montreal, Canada (26 to 28 July, 1996).

16. 'Agnihotra : The Message of Time' --- Paper by Dr. Madhukar P.Giak-wad. (Presented in the National Symposium on Unification of Modern and Ancient Sciences, held in Andheri, Mumbai on April 30, 1995).

17. Reports and booklets published from Shantikunj, Hardwar and Yug Nirman Yojna, Mathura.

18. 'The New Age Force of *Gayatri*' --- book by Ashok N. Raval. Published by S. Ramakrishnan, Executive Secretary, Bhartiya Vidya Bhavan, Mumbai, 1981.

PHOTOS



Photo-1: Acharya Pt. Shri N.P.Sharma (Ygya Purohit & Geeta Marmagya) Photo-2: Purohit & Yajman in Dainik Havan



Photo-3: Agnihotra Performance



Photo-4: Gayatri Mantra