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Herbal Dhoop Stick Preparation and Its Application in Bacterial Growth Reduction As Well As Pollutants Monitoring

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Abstract
Incense is an ancient tradition during various rituals in almost every religion. Previously, it was apparently only used for divine purposes. However, with the progress of time, it is being used for secondary purposes, such as air fresheners and insect repellents. Since ancient times people are using incense sticks in different forms on different occasions. Today, incense sticks are not only limited to fragrance purposes, but are also used as an air freshener and insect repellent. In various devout practices such as homa/ havans, cow dung, cow ghee. etc has been used in order to cleanse the environment and feel pleasant.
Dhoop is widely used in various religious rituals or practices in urban areas along with villagers. Dhoop there is a technique in Ayurvedic literature that is for its contribution in reducing microbial count in specific- as. There are different types of germs around us who are mainly responsible for health related problems in the form of influenza, pertussis, common winter, etc., patients suffering from swine flu, bronchial cramps, bronchitis Asthma, dyspnea, rhinitis, poor smell of nose and mouth can be assisted.
Medicated Dhoop is prepared by incorporating hydro-distillated extracts of Eucalyptus, Clove, Tulsi, Mentha, Ajwain, and Neem. By performing dhoopana, various air borne diseases can be prevented as the product being easily available in remote areas leading to its sterilization.

Keywords: Dhoop stick, influenza, polyherbal, fumigation, Antimicrobial, herbal, cow dung, cow ghee, cow milk, pollutant monitoring

1. Introduction

The main concern in today's age is change the atmosphere and is constantly polluted. For human survival there is a basic need for a clean environment on this planet. In a clean environment, clean air, clean Drinking water, fertile land and suitable Source of energy the presence of microorganisms in the air are main cause of many airborne diseases. Pathogen are responsible for airborne diseases spread through the air from an infected person to an infected person by action talking, laughing, coughing and sneezing. According to the U.S. Disease control centers have the potential for flu drops [1-2]
For clean air several methods are used to purify the breath. There are many chemical alternatives available for this in the market, but they have many unwanted consequences which can play with the health of living things to resist Chemicals, herbal products can have unwanted effects taken as an [3]. Herbal products provide properties like fragrance, it also evokes a sense of positivity in that area it is used to fulfill the purpose Clean the air. The current work is basically focused while describing in detail the process of

development of Dhoop, which can be used as an alternative to chemicals reducing the microbial load in the air. Ready all the basics needed in sunlight, are natural. Cow dung is clean in ingredients Butter, some herbs, and cow's milk. Dung has been used as a disinfectant for centuries. The formulation was developed using natural agents like cow dung, clarified butter, cow's milk and some herbs that are traditionally known for their aroma. Cow dung has been used as a source of disinfection in various homes since ancient times. In various Home/Havan, Cow dung, Cow Ghee, Cow urine, Camphor, etc. are in religious practices Used to purify the environment and feel pleasant. With the help of to the conventional wisdom, we have attempted to develop a method for preparing an incense dhoop. Pharmacopoeial quality using various cow products and plant powders to purify the air.This herbal incense stick is made from extremely economical sources and has a pleasant Fragrance. It can serve as an alternative to the use of chemicals for disinfection of air in various areas like homes, hospitals, washrooms etc.[4-5]

Dhoopana is a method by which drugs of herbal, herbomineral or animal origin are used for fumigation. Since Vedic period sterilization of house & environment around it by Dhoopana, has been going on traditionally. Dhoopana has been mentioned in Atharva Veda. Dhoopana has also been mentioned for its antimicrobial and growth promoting activities for the healthy production of plants. Ample references of Dhoopana are found in Brihatrayi proving their vital role in disinfection and sterilisation. It consists of a variety of Dhoopana Kalpanas aimed at deriving health, combating diseases and even purifying environment. These formulations have been used widely since long. The Dhoopana Drayvas mentioned in the Brihatrayi have a lot of potential to manage different diseases and for sterilizing in an economical and eco-friendly way without developing any drug-resistant microorganisms. It is necessary to undergo detailed study to identify the bioactive chemical moieties of the formulations and establish their safety and efficacy profiles. Standardising, characterising and marketing these dhoopana formulations is the need of the hour to bring a natural eco-friendly and cheap tool to combat benefits of dhoop formulation.

2. MATERIALS FOR NATURAL DHOOP STICK PRAPARTION

The list of materials used for the preparation of dhoop is as following …

1. Marigold flowers
2. Neem leaves
3. Havan samgri
4. Milk
5. Cow dung
6. Pure ghee
7. Activated Charcoal
8. Camphor
9. Loban
10. Essential oils (rose and lavender oil)
11. Gud , Googglle

3. METHOD FOR NATURAL DHOOP STICK PRAPARTION

Make the powder of All the plant part then all the plant powders and cow dung were taken in a clean, dry mortar and pestle and grinded finely. Cow ghee was added as a binder, camphor was added as a burning agent and was mixed well to form a wet mass. A plastic syringe was cut from the apical side so as to open

the mouth of the syringe completely. Dhoop sticks were made using the opened syringe and a plunger. Also used hands for making dhoop batti of shape circular pyramid.

The long extradites so formed were cut into desired sizes. These dhoop sticks were dried for 4 days in an oven at 40^0C to dry them completely and then stored in an air tight container. The sticks were put in a container filled with essential oils. The stick being porous by its capillary action rapidly absorbs the oils. Later, these sticks were dipped in neem oil which fixes the previously used volatile oils. These sticks were used for evaluation of cleansing activity.

All plant powders were inspected by ordering from the local market and then used for the preparation of dhoop. This dry dung was brought from a local dairy milk suppliers in thane district. This dung is then mixed in a home grinder and Sieved to get a fine powder. Cow's milk and ghee were also ordered from the local market. After checking its quality all components are taken in equal proportions.

Table No. 1:- Ingredient and there scientific name

Sr. No.	Ingredients	Scientific name	Plant part used	Quantity
1	Zendu	Marigold	Petals	2g
2	Neem plant	Azadiracta indica	Leaves	2g
3	Camphor	Cinnamomum camphora		3ps
4	Guggul	Commiphora mukul	Resine	2g
5	Cow ghee			4ml
6	Cow dung			9g
7	Jaggery	Barassus flabelifer		3ml
8	Loban	Styrax benzoin	Resine	2g

Fig.1 :- Prepared herbal dhoop sticks

4. Applications:
4.1) Reduction in bacterial growth
4.2) Study on different pollutants

4.1) Reduction in bacterial growth

Sr. No.	Duration	Temperature	Colour
1	4 days	4^0 C	Dark brown
2	4 days	Room Temperature	Dark brown
3	4 days	60^0C	Dark Brown

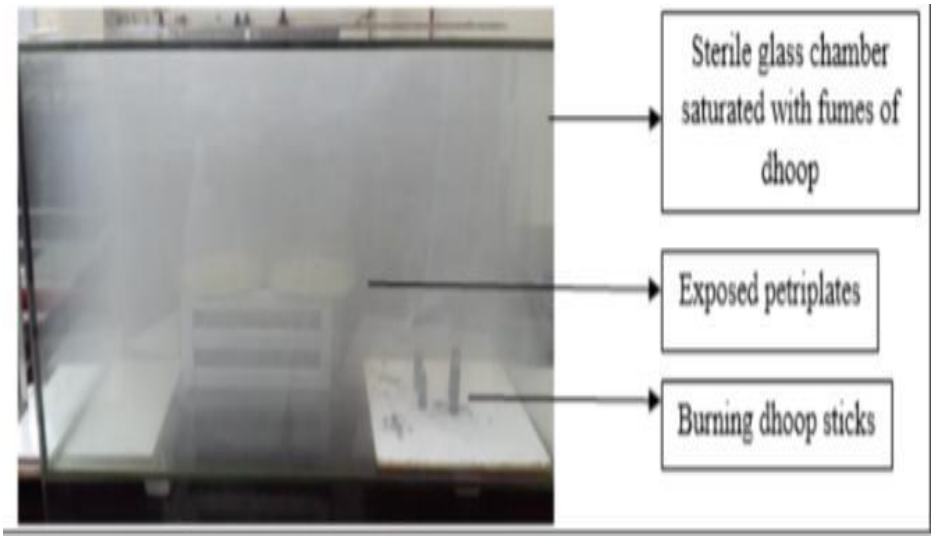

Fig. Experimental work:-

Evolutionary parameters

- **Physical Analysis**
- **Organoleptic property**

Color :- Dark brown
Odour :- minty
Moisture content
Initial WT. :- 3gm
Final WT. :- 2.98 gm
M. C. = Initial WT. – Final WT. * 100
Initial WT.
=3-2.98*100
3
=0.6%

Stability studies

Microbiological test :-

Preparation of Medium for bacterial growth

Nutrient agar is a general purpose medium suprting growth of a wide range of non-fastidious organisms.It typically contains (mass/volume):

- 0.5% peptone - this provides organic nitrogen
- 0.3% beef extract/yeast extract - the water-soluble content of these contribute vitamins, carbohydrates, nitrogen, and salts
- 1.5% agar - this gives the mixture solidity
- 0.5% sodium chloride - this gives the mixture proportions similar to those found in the cytoplasm of most organisms
- distilled water - water serves as a transport medium for the agar's various substances
- pH adjusted to neutral (6.8) at 25 °C (77 °F).

These ingredients are combined and boiled for approximately one minute to ensure they are mixed and then sterilized by autoclaving, typically at 121 °C (250 °F) for 15 minutes. Then they are cooled to around 50 °C (122 °F) and poured into Petri dishes which are covered immediately. Once the dishes hold solidified agar, they are stored upside down and are often refrigerated until used. Inoculation takes place on warm dishes rather than cool ones: if refrigerated for storage, the dishes must be rewarmed to room temperature prior to inoculation.

Table 2: Experimental conditions for antimicrobial evaluation of dhoop stick

Sr No.	Nutrient agar plate (in duplicates) exposed To	Time of exposure
1	Garbage Area	15
2	Washroom	15
3	Laboratory	15
4	Basing	15

EXPOSURE OF PLATES:-

After that the prepared nutrient agar plates were exposed the nutritient agar plat at experimental area (before the dhoop stick burning) And then the plates were closed and kept it in safe place .

Then the nutrient agar plates were exposed to the prepared burning dhoop sticks for 15 min and closed it and observed the changes in both plates .After 24 hours or 48 hours count the number of colonies in dhoop exposed plate and dhoop not exposed plate and compared them with each other.

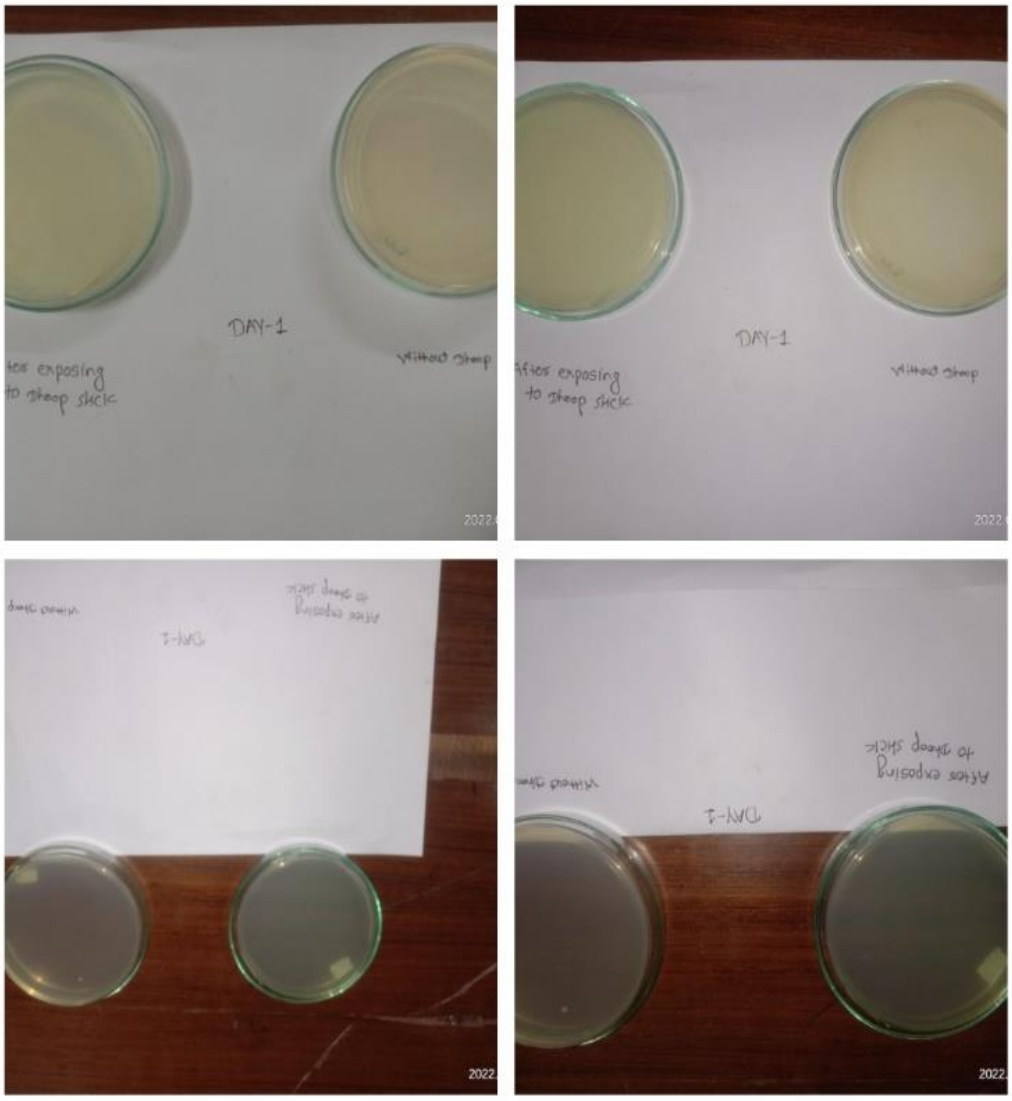

Fig. nutrient agar plates with and without exposure to dhoop sticks

The nutrient agar agar plates before exposure to dhoop shows the higher numbers of bacterial colonies and plates after exposure to dhoop sticks it shows comparatively less number of bacterial colonies.

4.2) Study on different pollutants

From the environmental point of view we think the pollution is mainly coming from the Industries, vehicle and other sources. Out of total average population of our world atleast 30% are burning the inscence sticks at their home and offices. So with the help of above device we monitored the changes in CO_2 level as well as formaldehyde level. And observed that, during the burning of dhoop sticks in close room the carbon dioxide level of the nearest area has increased and it was measured by air monitoring device.

On the other hand, in open room the carbon dioxide level was the same as it was before burning the stick [13]

Fig. Air monitoring device

Device designed to measure a concentration of aerosol, VOC, CO, CO_2, and temperature-humidity to monitor the air quality.

CARBON DIOXIDE SENSOR :-

Although CO_2 is produced both naturally and through human activities, it is not classified as an air pollutant. However, it is treated as a pollutant because the amount of oxygen required for breathing becomes insufficient at high concentrations of CO_2 in an indoor space. CO_2 is a representative greenhouse gas that causes global warming [11-13]. Thus, the CO_2 gas sensor module CM1103 is installed to detect and monitor CO_2 concentrations. The sensor uses nondispersive infrared technology (NDIR) that have advantages of high precision, fast response, and factory calibration. Also, it features excellent long-term stability with low power consumption. The detailed specifications are listed in Table 3 [11]

Table No. 3:- specification of CO2

Specification	Value
CO_2 measurement range	0-2000 ppm up to 0-10000 ppm
Resolution	10 ppm
Accuracy	40ppm+2% reading
Response time	30 sec
Maximum drift	±2% FS
Operating voltage	DC 5V +_ 5%
Operating current	Average: 70 mA, peak: 120 mA
Operating temperature	0 to 50 Celsius
Operating humidity	0 to 90% RH (noncondensing)

VOLATILE ORGANIC COMPONENT (VOC) :-

Volatile organic compounds (VOCs) are hydrocarbon-based products such as petroleum products and organic solvents that are easily vaporized in air due to high vapor pressure. Also, organic materials such as liquid fuels, paraffins, olefins, and aromatic compounds, which are commonly used in the living environment, are defined as VOCs. These compounds may cause damage to the nervous system through skin contact or respiratory inhalation, indicating the importance of monitoring [14-15]. A VOC sensor module GSBT11-P110 from Ogam Technology is installed in Smart-Air. The sensor detects many types of VOCs, such as formaldehyde, toluene, benzene, xylene, and organic solvents, and the main specifications are illustrated in Table 4 [15]

Table No. 4:- specification of VOC

Specification	Value
Sensor input voltage	1 to 12 V
Operating temperature	-10 to 50 Celsius
Operating humidity	5 to 95% RH (noncondensing)

Reaction time	Less than 10 sec
Recovery time	Less than 30 sec
Power consumption	Below 460 mW
Sensitivity (β) for toluene	(concentration: 1.0 ppm)
Sensitivity (β) for H_2	(concentration: 100 ppm)
Sensitivity (β) for i-butane	(concentration: 100 ppm)
Accuracy	±7%

Formaldehyde Study

Formaldehyde is mainly emitted by industrial sources, but it can occur naturally in the environment. Formaldehyde may be released in the smoke of forest fires and can also be found in animal waste and sea water.

Table No. 5:- Time and HCHO

Sr. No.	Time (min)	HCHO (mg/m3g
1	00	0.015
1	02	0.020
2	04	0.027
3	06	0.023
4	08	0.027
5	10	0.032
6	12	0.034
7	14	0.031
8	16	0.026
9	18	0.037
10	20	0.039
11	22	0.042
12	24	0.044
13	26	0.045
14	28	0.047
15	30	0.048
16	32	0.058

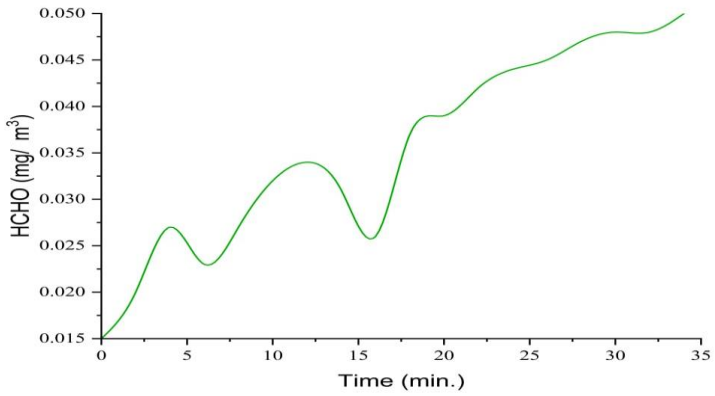

Fig. : - Graph between concentration of formaldehyde (HCHO) vs time.

TVOC STUDY:-

It is total volatile organic component they typically contain elements such as **hydrogen, oxygen, fluorine, chlorine, bromine, sulfur, or nitrogen**, which are mostly released from burning fuel such as gasoline, wood, coal, or natural gas. VOCs are also emitted from oil and gas fields and diesel exhaust.

Table No. 6:- Time and TVOC

Sr. No.	Time (min)	TVOC (mg/m3)
1	0	0.317
2	2	0.330
3	4	0.335
4	6	0.339
5	8	0.342
6	10	0.368
7	12	0.393
8	14	0.419
9	18	0.393
10	20	0.368
11	22	0.317
12	24	0.355
13	26	0.342
14	28	0.355
15	30	0.420
16	32	0.482

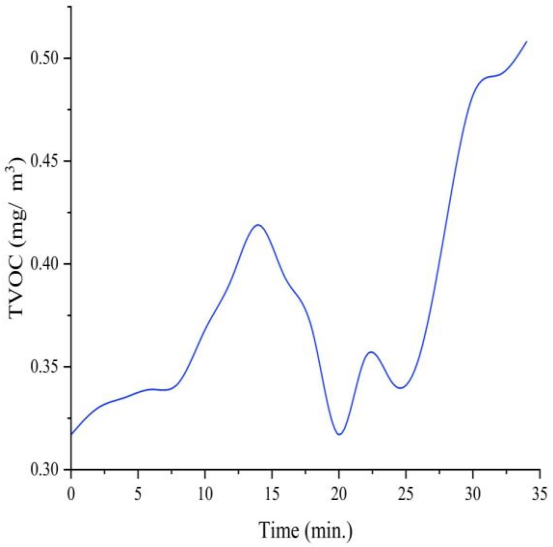

Fig. : - Graph between TVOC VS Time

CO_2 STUDY

The concentration of carbon dioxide in Earth's atmosphere is currently at nearly **412 parts per million (ppm)** and rising. This represents a 47 percent increase since the beginning of the Industrial Age, when the concentration was near 280 ppm, and an 11 percent increase since 2000, when it was near 370 ppm.

Table no. 7:- Time and CO_2

Time (min)	CO2 (PPM)
0	413.5
2	414
4	420
6	435
8	442
10	460
12	484
14	505
16	518
18	533
20	541
22	544
24	556
26	562
28	569
30	640
32	651
34	684

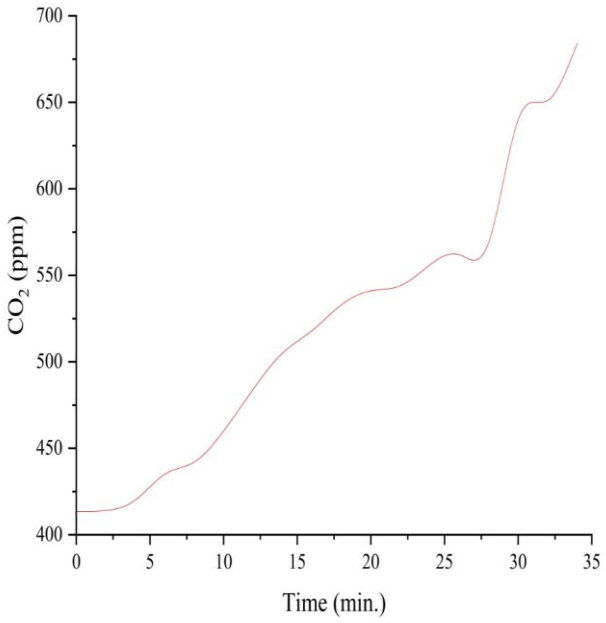

Fig. : - Graph between Concentration of CO_2 Vs Time.

5. RESULTS AND DISCUSSION:-

From the below chart and data, it can be well understood that Herbal dhoop Stick successfully shows desired antimicrobial activity. It was prepared by the above procedure and Serving its inhibitory action on aero micro-flora

Table No. 4:- statistics of microbiological studies

Sr. No.	Plates exposed to	No. Of colonies before exposure to dhoop sticks	No. Of colonies after exposure to dhoop sticks
	Media used	Nutrient agar	Nutrient agar
1	Garbage Area	15	2
2	Washroom	24	5
3	Basing	23	7
4	Laboratory	14	1

Thus all exposed plates, became almost clear Negligible number of colonies. This precedes us determining the antibiotic action of this herbal incense during the stick survey, most of the volunteers were found the smell of incense is admirable. The majority of them the wooded and resinous odor was found and some were found like mint and mint (camphor). 80% of them there was no burning sensation in his eyes. All they found the scene acceptable and acceptable if they want to use / recommend incense, if it has been shown to have anti-microbial action.

Table No.5:- sensory analysis

Sr. No.	Questions	Yes	No
1	Is the smell appreciable?	34	2
2	Smoke is irritating?	0	28
3	Use the product at home?	36	4
4	Will you recommend the product?	29	0
5	Relief from nasal congestion?	16	2

6. CONCLUSION

The current work focuses on the preparation and evaluation of natural and herbal incense formulations for cleansing. The results from the atmosphere above show that incense can purify the environment and potentially and effective source of disinfection in various areas. Thus instead of using chemical sources and harmful UV rays for disinfection in hospitals. Etc., having this herbal incense defined quality and which is made from ease and affordable resources can be used. There may be ongoing work extended to schools, colleges, hospitals, public areas, toilet etc.

It can help create positivity in the atmosphere and room. It can also act as a purifier and air freshener. Natural and biodegradable remedies like this herbal incense can potentially help purify the internal environment and Sustainable conservation without any damage atmosphere unlike various chemicals and aerosols. In the future, larger studies may be planned for in-depth study the role of this formulation in residential or commercial zones with high air pollution.

"Burning a large number of dhoop sticks in an enclosed space can lead to the accumulation of particulate matter and volatile organic compounds, which may be harmful to respiratory health. In contrast, burning them in an open area allows for better dispersion of smoke and reduces potential health risks."

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