

**FORMULATION OF ORGANIC DHOOP AND EVALUATION OF ITS
ANTIMICROBIAL ACTIVITY FOR FUMIGATION**

A RESEARCH PROJECT

SUBMITTED BY

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UNDER THE GUIDANCE OF

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“Dissemination of education for Knowledge, Science and Culture”

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CERTIFICATE

OF

RESEARCH PROJECT COMPLETION

This is to certify that Miss. Muskan Salim Jamadar studying in M.Sc. part II Microbiology at Vivekanand College, Kolhapur [Empowered Autonomous] has sincerely completed research project work entitled **“FORMULATION OF ORGANIC DHOOP AND EVALUATION OF IT'S ANTIMICROBIAL ACTIVITY FOR FUMIGATION”** during academic year 2023–2024.

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This is to certify that **Mr. Shivam Subhash Katkar** studying in M.Sc. part II Microbiology at Vivekanand College, Kolhapur [Empowered Autonomous] has sincerely completed research project work entitled “**FORMULATION OF ORGANIC DHOOP AND EVALUTION OF IT'S ANTIMICROBIAL ACTIVITY FOR FUMIGATION**” during academic year 2023–2024.

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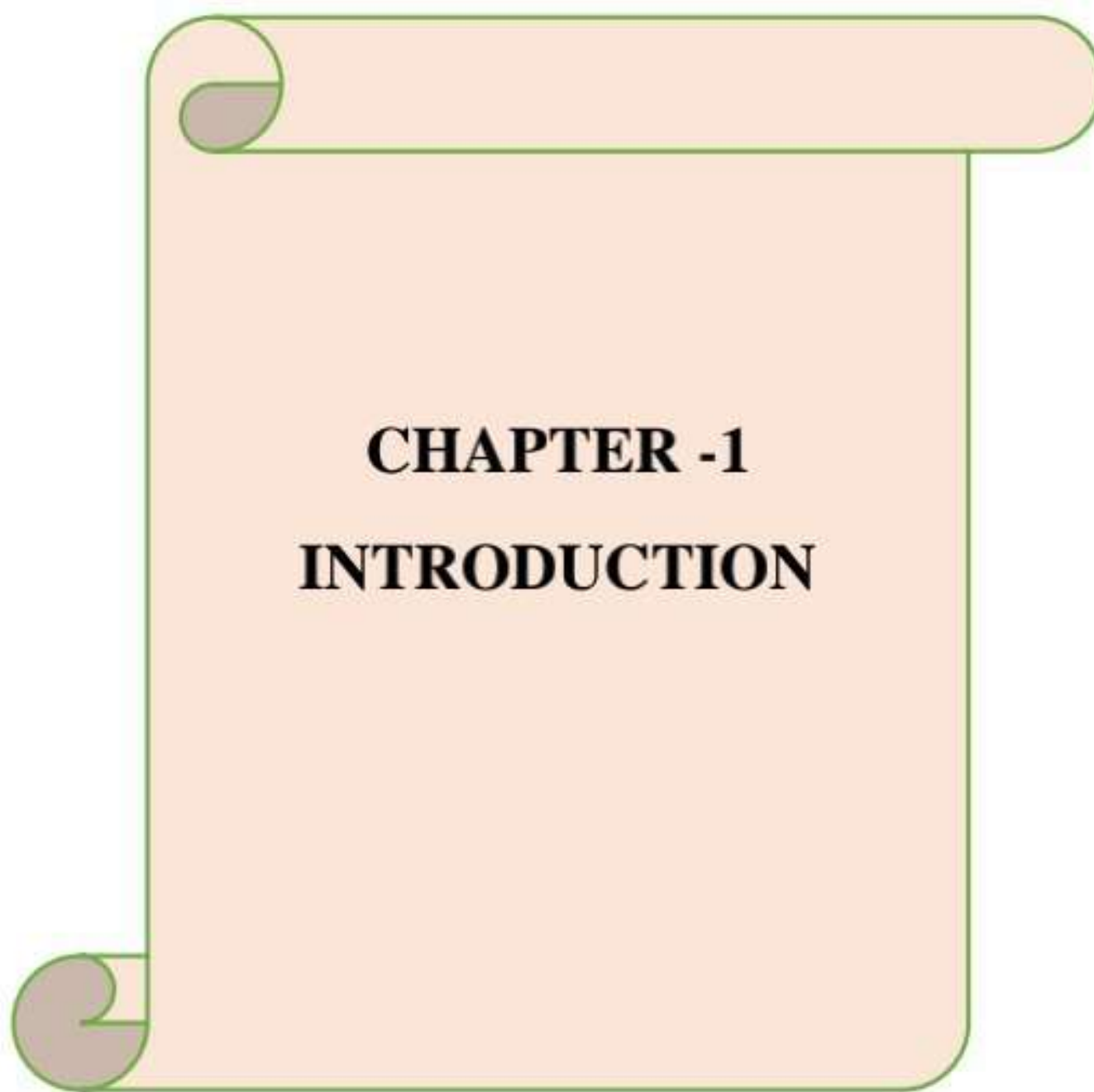
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CHAPTER -1
INTRODUCTION

1.0 INTRODUCTION:

In 21st century while living in this modern world major concern is change in environment and increasing pollution. So along with other human need clean environment and air has becoming the basic need for human (1). Population has reduced the quality of air. Presence of different types of microorganisms are cause of different airborne diseases. Such air born pathogen can be spread from one person to non-infected person through act of coughing, sneezing, verbal communication, etc. Nowadays various approaches are being used to clean air. Most of this approach includes use of chemicals which have some side effects to health. To counteract these side effects of chemicals, herbal-organic product can be a great alternative (1). Also microbial load of environment is major concern in pharmaceutical and other similar areas. Several traditional methods such as Dhoopana and Havana has been used in fumigation process to reduce load of microbes (3). As per Indian culture in various religious practices dhoop, diva, havan are used to remove microbes from environment Dhoopana is said to be extremely effective in preventing as well as curative aspect. Ayurveda is an ancient science of life that has always focused on nerture and maintenance of balance between body, mind, soul and spirit as individual. Fumigation process Dhoopana as described in Ayurveda is a method of drug delivery though inhalation various herbal plant can be used in fumigation (3). Traditionally fumigation is carried out by making hot embers with cow dung cake & coconut shells and putting the powder on ember. The fumes which emanate can be used to disinfect room & surrounding. It can be used safely as it does not have toxicity of chemical fumigant (2).

Fumigation is the method also used in pharma companies to control microbial contamination. Generally, fumigation is done by using chemical fumes like carbon, potassium, formaldehyde, ammonia, etc. Such chemicals are harmful for humans as well as environment. The chemical fumigation uses chemical that can cause skin irritation, eye irritation, redness of skin and eyes, headache, hypersensitivity allergic. Some fumigant components are carcinogenic agent that can cause cancer. Use of organic herbal, dhoop for fumigation is totally harmless of human beings, it can reduce 80-90% load of microorganism. General modern methods of sterilization are fumigation such as fogger machine or silver nitrate however all these methods of fumigation or disinfection in modern science are quite expensive and having harmful or hazardous effects such as their carcinogenic nature. Chemical based dhoop or fumigant is upgraded due to complex process of these current fumigation techniques i.e.

lengthy process, smell and emerging resistance, cost convenient remedies of sterilization in ayurveda which can be adopted by common people at home (4). The current work is focused on modifications in general dhoop formulation by incorporating cow products and several herbs. With the help of traditional knowledge, we tried to develop a method to prepare a herbal dhoop having antimicrobial activity against airborne microorganism using various cow products and plants powder for cleansing the air. This organic dhoop is prepared from easily available and cost-effective raw material and has a pleasant smell. This dhoop can serve as an alternative to the use of chemical based dhoop and incense stick and other chemical based products used as dhoop and disinfection of air in various areas such as households, hospitals, offices, etc. (3). fumigation has become a very popular method of disinfection, whereas many agents used as fumigants have been withdrawn for ecological reasons. Dry fogging (fumigation) is a relatively new decontamination technology using a mist that behaves more like a gas and easily fills the sanitized space. In contrast to wet fog, ultra-fine particles of the dry mist settle on the surfaces after some time; hence, dry mist does not wet surfaces with which they are in contact. The undoubted advantage of fumigation is the ability to disinfect areas that are difficult or even impossible to clean manually by wiping.

Disinfection is a process conditioned by many factors. Its effectiveness depends mainly on the duration of action and concentration of the disinfectant, as well as on temperature, humidity and surface target. Widely used decontamination methods are based on liquids or gases, and the preparations used in them are divided into bactericidal, virucidal, and fungicidal, depending on their antimicrobial activity. Modern fumigant research is not concerned with establishing a lethal dose, as is already known for most compounds, but is more geared towards finding ways to minimize effective doses of available disinfectants by studying their mechanisms of action and physical conditions, and combating microbial resistance. Due to the fact that fumigation is safe for equipment, and at the same time enables the highest possible bactericidal level, this method is widely used in various areas, both medical and non-medical. Fogging technology is used in the medical, pharmaceutical, and food industries, as well as in transportation for air fumigation or surface disinfection in closed spaces, such as hospital and laboratory rooms, isolation rooms, incubators, warehouses, refrigerators, ships, trucks, railway containers, and aircraft.

In the twenty-first century, in the era of a global pandemic, fumigation may play one of the key roles in fighting and preventing the spread of COVID-19. Fumigation can also be performed in public places and medical areas. Infection with the SARS-CoV-2 virus occurs

primarily through secretion or droplets from the respiratory tract, which are released when infected people cough, sneeze, talk, or sing. The particles released from the respiratory system contain the virus and can reach the mouth, nose or eyes of a healthy person by the air-droplet path and cause infection. Another equally important mode of transmission of the virus is the contact route, and hands are its essential element. After touching contaminated surfaces and objects, the hands carry the virus to the areas of the mouth, nose, and eyes; the virus remains in an active, infectious form from several hours to several days on various surfaces. Fogging can disrupt such virus transmission pathways, and fumigation is therefore used to disinfect public places as well as medical areas(5).

Herbal or organic products impart properties like fragrance as well as it induces a sense of positivity in the area it is used in addition to serve the purpose on elaborating the process of development of dhoop sticks, which can be used as an alternative to chemicals for decreasing microbial load in the air. For the preparation of the dhoop sticks all the basic ingredients that are required are natural. The ingredient includes cow dung, cow ghee, medicinal plants, cow urine. Cow dung has always been used as a disinfectant from ages. In many religions while performing practices like home or haven, ingredients like cow dung, camphor, cow ghee and urine are used that helps in cleaning the environment and impact a feeling of pleasantness. By utilizing the traditional knowledge, a method has devised by which dhoop sticks can be prepared from economical sources. This dhoop sticks having pharmacopeial quality can be made from cow product and plant powder and it imparts pleasant smell. These sticks can act as disinfectant for the air in areas like home, hospitals, washroom. Fragrance material found in incense products plays a major role as it helps in providing aroma. Aroma can be of any kind such as rose, mogara, jasmine, Chameli. Generally, the fragrances material basically obtained from plant as plant extract or chemicals derived from them termed as phytochemical (1) but instead of chemical fragrance we used essential oil and as a dilution solvent use coconut oil.

1.1 Different types of incense and dhoopbatti in India

Incense :

Traditionally India has been using incense in many occasions which may be of social importance or religious importance. In India incense sticks are referred as agarbatti. Agarbatti is form of incense where bamboo sticks holds the incense paste around it. India was first to start preparing incense in a uniform system. In modern system of incense making, medicinal

priest performs the responsibility of making incense. In many places of the world a belief system is quite prevalent that burning incense imparts mystical power of healing.

Types of incense:

There are different types of incense which shows different healing property. Below are few types of incense sticks are mentioned.

1. Dragon's Blood Incense — This incense helps in relieving in conditions like raging fevers, pain of ulcer, stomach virus symptoms, diarrhoea etc.
2. Lavender Incense — It provides soothing and calming experience. It is helpful to get relief after a busy stressful day.
3. Sandalwood Incense — It reduces anxiety and induces feeling of spirituality in an individual
4. Indian Cedar Incense — Helps in recovering from mood disorders and depression
5. Amber Incense— the various systems of a body is balanced
6. Patchouli Incense— soothes the nerves and makes them more stronger

Dhoopbatti:

The name Dhoop came from the name of tree called Dhoop which indigenous to eastern India. A chip from these trees imparts pleasant fragrance when they are burnt. Dhoop or Dhoopbatti is not similar to incense stick or Agarbatti. Even from physical appearance they are different. Incense dry and found as a stick but Dhoop is a found in paste form with little bit of dampness in it.

Different types of dhoopbatti:

1. Charcoal Type: In preparation of this kind of dhoopbatti an unscented stick is dipped in mixture made up of essential perfumes and oils. Additionally, charcoal is added that will act as a fuel to burn the dhoop. For the purpose of binding the mixture to the stick black resins are used which impart the property of binding.
2. Masala Dhoop: As the name suggests masala dhoop is made by mixing variety of aromatic ingredients to prepare a solid Dhoopbatti. Then by using water or other adhesives it is made into a sticky paste. Different types of natural ingredients such as sandalwood, rubber resins,

natural oils, root extracts, and leaves and stem of different medicinal plants are utilized for preparation of masala Dhoop (1).

ANTIMICROBIAL USES OF COMPONENTS:

1) *Eucalyptus* (Nigiri) :

Cough and cold:

Many medicines to treat coughs and the common cold contain eucalyptus. It is found in many lozenges, cough syrups, rubs, and vapor baths throughout the United States and Europe. Herbalists often recommend using fresh leaves in gargles to soothe sore throats and treat bronchitis and sinusitis.

Eucalyptus ointments are also used on the nose and chest to relieve congestion. Eucalyptus oil helps loosen phlegm, so many people breathe in eucalyptus steam to help treat bronchitis, coughs, and the flu (10).

Plaque and gum disease:

Eucalyptus oil is rich in cineole, an antiseptic that kills the bacteria that can cause bad breath. Some antiseptic mouthwashes use eucalyptus along with other oils, and have been shown to help prevent plaque and gingivitis (10).

Other uses:

On the skin, eucalyptus oil has been used to treat arthritis, boils, sores, and wounds. The oil is also used in some insect repellents. Preliminary studies have also shown that oil of lemon eucalyptus may also keep ticks away (10).

2) *Camphor*:

Camphor may have decongestive properties and decreases inflammation in the lungs and throat. It might aid in managing nose blocks and treats congestion. It may work on the nerves and reduces cough by acting as a cough suppressant. It might be effective against several respiratory disorders. (2) However, you must visit your doctor and follow their advice before consuming camphor for respiratory problems.

Potential Uses of Camphor for Skin:

Experience relief and a refreshed feeling with camphor's skin-calming powers in managing skin conditions. When used as a lotion (0.1 to 3%), camphor may act as a soothing anti-itch remedy and provide a gentle cooling sensation (11).

Camphor leaves may be used in the management of conditions characterised by allergic skin inflammation like atopic dermatitis. It has anti-inflammatory activity and it might help to reduce the level of serum immunoglobulin (11).

Potential Uses of Camphor for Preventing Low Blood Pressure:

A study found that both systolic and diastolic blood pressure increased using a mixture of camphor and hawthorn extract (11).

3) Bay leaf:

Bay leaf is an herb that is commonly used in cooking. It comes from the bay tree (*Laurus nobilis*), which is commonly found in the Mediterranean region (12).

Bay leaf is also used in folk medicine. Chemicals in bay leaf might affect blood sugar and cholesterol levels (12).

4) Loban:

Natural & Ayurvedic Ingredients: Ashpveda loban is a mix of popular Ayurvedic herbal ingredients like Tagar, Nagarmoth, Kapoor, Neem Patta, Safed Chandan and Goggal duly certified by the Ministry of AYUSH.

Has a mesmerizing fragrance & multiple other benefits: Loban has antiseptic, anti-inflammatory, anti-depressant, analgesic, astringent, expectorant, and stimulant properties. Loban is also used in the treatment of health-related problems. Loban is considered to be a good medicine in Ayurveda.

Premium & traditional dhoop:

Used since ancient times to worship God. Loban Dhoop also creates a positive atmosphere and removes negativity.

Vegan, free from parabens, sulphates (sles/sls) and cruelty-free: All our products are free of harmful chemicals and preservatives. Our products are unadulterated, non-toxic, not tested on animals and free from parabens, sulphates and synthetic fragrances.

5) *Lavender oil:*

Lavender is an herb native to the Mediterranean region. It is commonly used to flavor foods and beverages and as a fragrance in soap and other cosmetic products.

Lavender is also one of the most widely grown essential oil crops in the world. This product, which is also referred to as lavender aromatherapy oil, is typically made by distilling the herb's dried flowers with steam.

Essential oils are too strong to use in their pure form. They are usually diluted with other oils, creams, or gels to reach a solution that contains a small percentage of the essential oil.

Health Benefits Like other essential oils, lavender essential oil is said to benefit your health in a variety of ways. However, many of its uses are not conclusive.

6) *Tagete recta:*

In traditional medicine, pot marigold petals have been made into ointments, extracts, and infusions and used for a variety of ailments, including:

Fevers, Jaundice, Stomach, ulcers, Conjunctivitis, (pink eye) Liver problems Burns and wounds, to stop bleeding

7) *Neem oil:*

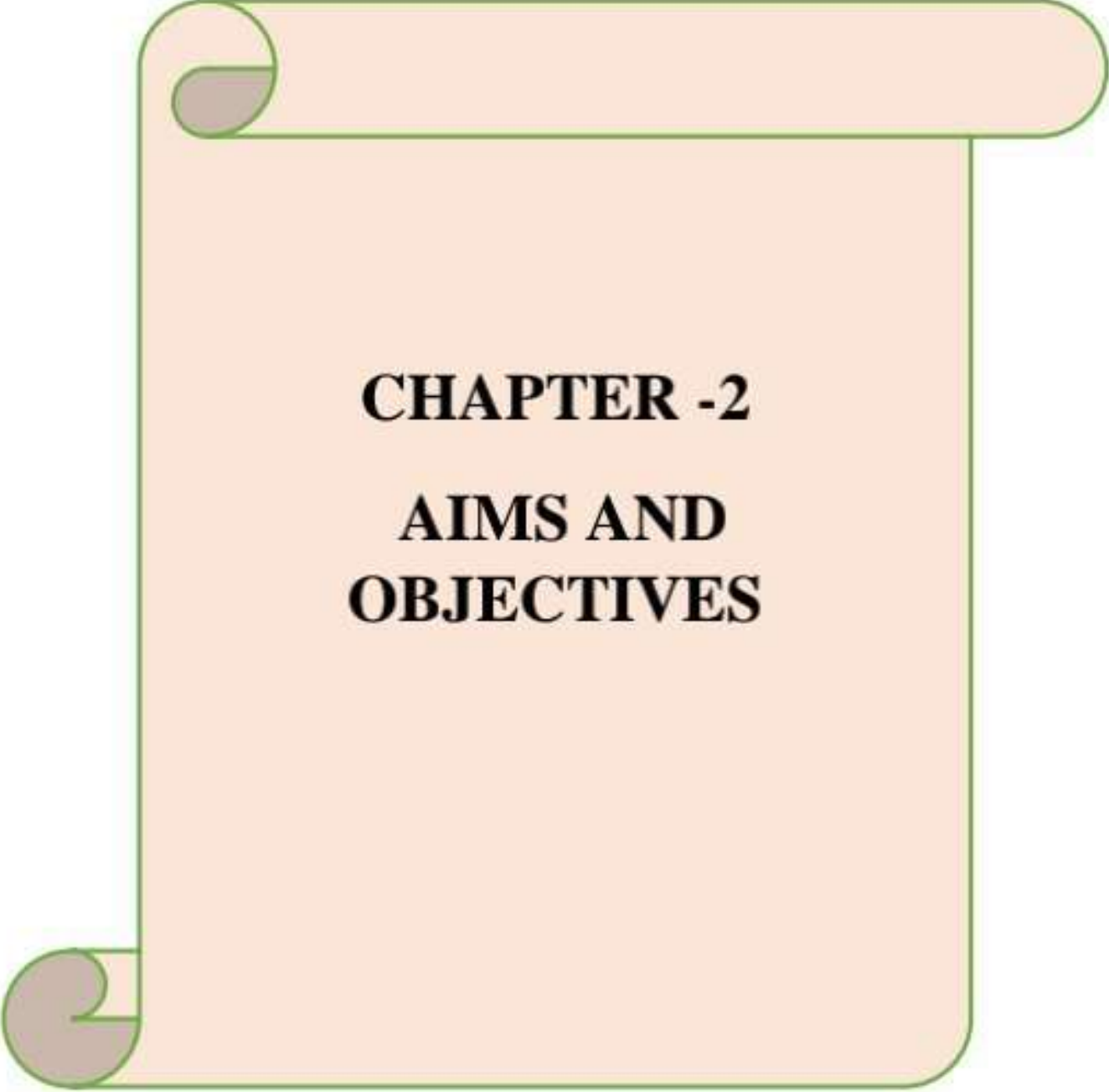
Possibly Effective for Tooth plaque. Applying a gel containing neem leaf extract to the teeth or using a neem mouthwash can reduce the amount of plaque on the teeth. But it is not clear if neem is as helpful as using chlorhexidine mouthwash or gel.

A mild form of gum disease (gingivitis). Applying a gel containing neem leaf extract to the teeth or using a neem mouthwash can reduce gingivitis in some people. But it is not clear if neem is as helpful as using chlorhexidine mouthwash or gel.

8) *Garlic (Allium sativum):*

Is an herb related to onion, leeks, and chives. It is commonly used for conditions related to the heart and blood system. Garlic produces a chemical called allicin. This is what seems to make garlic work for certain conditions. Allicin also makes garlic smell. Some products are made "odorless" by aging the garlic, but this process can also change the effects of garlic. People commonly use garlic for high blood pressure, high levels of cholesterol or other fats in the blood, and hardening of the arteries. It is also used for the common cold, osteoarthritis, and many other conditions, but there is no good scientific evidence to support these uses. There is also no good evidence to support using garlic for COVID-19. Possibly Effective for

A painful uterine disorder (endometriosis). Taking garlic powder tablets by mouth daily for 3 months seems to improve pain in people with this condition. Hardening of the arteries (atherosclerosis). Taking garlic powder by mouth, alone or with other ingredients, seems to help slow hardening of the arteries.

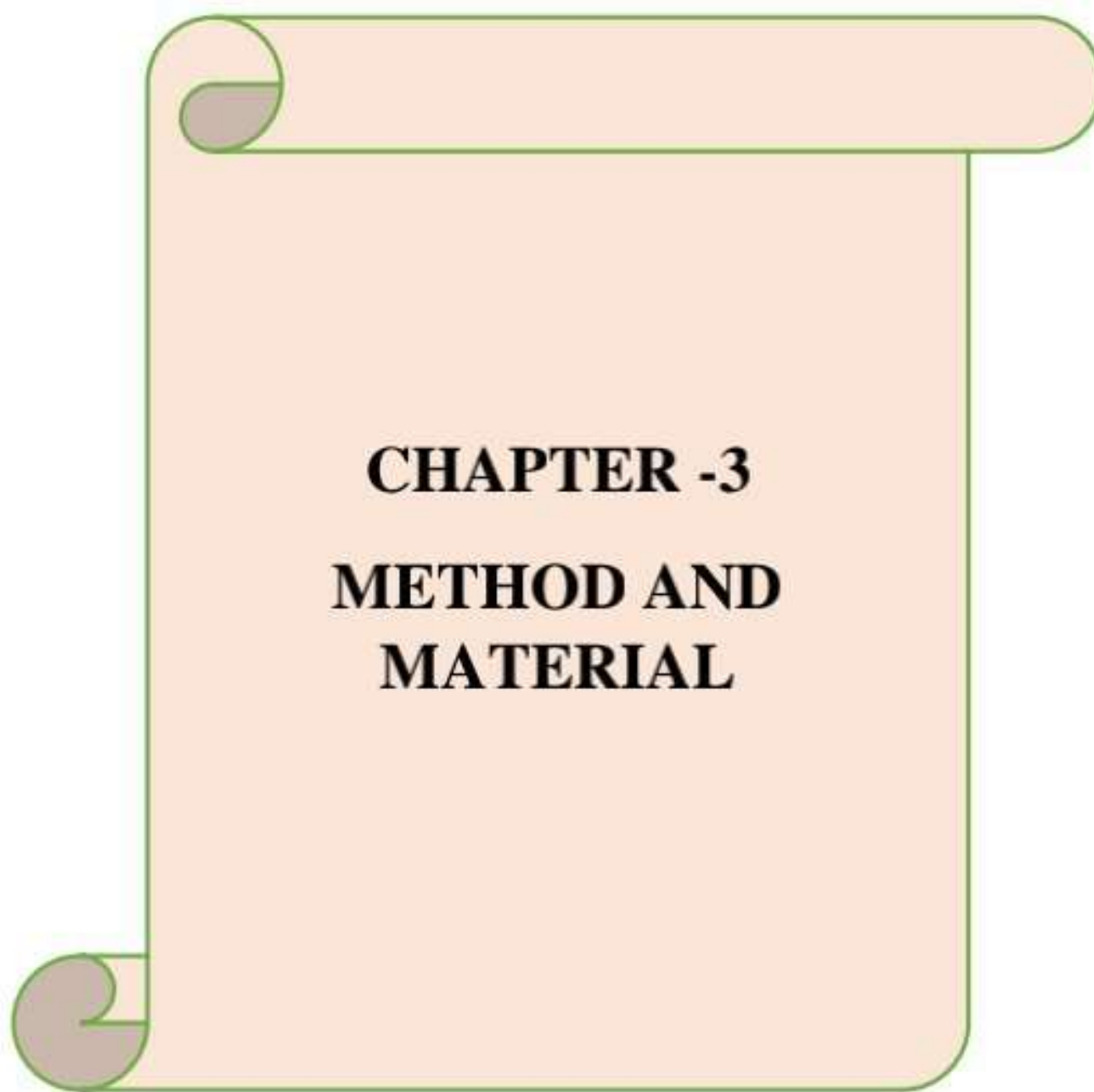


CHAPTER -2
AIMS AND
OBJECTIVES

2.0 AIMS AND OBJECTIVES

The chemical based dhoop or fumigant is upgraded due to complex process of these current fumigation techniques i.e. lengthy process, smell and emerging resistance, cost convenient remedies of sterilization in ayurveda which can be adopted by common people at home The current work is focused on modifications in general dhoop formulation by incorporating cow products and several herbs. By keeping this in mind, we have set some objectives as:

- 1] To prepare chemical free dhoop.
- 2] To check evolution of dhoop against antibacterial and antifungal activity.
- 3] To use dhoop as an alternative to chemical fumigation for pharmaceutical sector.
- 4] To check sensory analysis of organic dhoop.



3.0 MATERIAL AND METHODS:

3.1 MATERIAL:

The present work was undertaken at Vivekanand college Kolhapur (Empowered Autonomous), located in Tarabai Park, District Kolhapur, Taluka Karveer (3). Cow dung, cow urine, cow ghee, were procured from local farmer. Garlic peels, bay leaf, were obtained from kitchen material. *Camphor* leaves, *eucalyptus* leaves (nigiri), were collected from college garden. Saw dust were procured from timber market, Kolhapur. *Tagetes erecta* flower (zendu) collected were after house hold puja. Coconut husk powder obtained from kitchen. *Neem* oil, *eucalyptus* oil, lavang oil, lavender oil, coconut oil, loban were purchased from Bawadekar ayurvedic shop. Honey was purchased from local shop. All the material used in dhoop mentioned were pictures in fig. 1,2,3,4,5,6,7,8.

3.2 METHODS:

1) Preparation of organic dhoop :

All the plant material i.e. flower, bay leaf, eucalypts leaves, camphore leaves, were air dried and grind fine powder. Cow ghee, cow dung, cow urine taken in clean plate and added all plant powders. Mix well properly mash the all material and prepare a dough. Add essential oil, neem oil, lavender oil, honey, loban powder, coconut husk powder macerated in the form of dough. By using a plastic piece of pipe as a mold and prepare dhoop sticks. This dhoop sticks were air dried or sun dried for 4 to 5 days. After drying the dhoop sticks, deeped in essential oil diluted with coconut oil for the fragrance. Then the dhoop sticks ready for the further testes(9). Assembly of dhoop sticks shows table no.1 and fig. no. 1.1 to1.9, Fig no.2.1 to 2.4

2) Evaluation of organic dhoop components for antimicrobial activity:

a) Sample preparation:

Each sample was prepared using each component of dhoop including nilgiri leaves powder, camphor leaves powder, bay leaf powder, garlic peels powder and neem oil. 2 gm of powder of each of these components was mixed in 10 ml sterile distilled water separately followed by stirring on rotary shaker overnight.

b) Testing for antimicrobial activity :

The antimicrobial activity of each component of dhoop sticks was studied by agar well method. In this method the effect of each component of dhoop stick was studied against Gram negative bacteria *E. coli* and Gram positive bacteria *Staphylococcus aureus*.

The 24 hrs old fresh suspension of both organisms was then spread inoculated on sterile nutrient agar plates. Then wells were formed in the plate by using cork borer. The 0.1 ml of sample was added in each well. All these plates were kept in refrigerator for 10 min for diffusion of sample. Finally the plates were incubated at 37°C for 24 hrs. After incubation, the plates were observed for the clear zone of growth inhibition and zone diameter was measured, that zone mentioned in table no.2. The zone of inhibition shown in Fig. no. 3.1 to 3.3

3) Evaluation of dhoop sticks for antibacterial and antifungal activity:

To check activity of dhoop against bacteria and fungi in closed cabinet and open area., The study of air quality before & after fumigation using our prepared dhoop stick was carried out in laboratory of department of microbiology, Vivekanand College, Kolhapur [Empowered Autonomous]. It specifically focused on antimicrobial activity of prepared organic dhoop by passive air sampling technique using sterile nutrient agar & sterile potato dextrose agar in duplicates (2 set of plates exposed in same area) which were exposed to different areas as follow. Table no.5

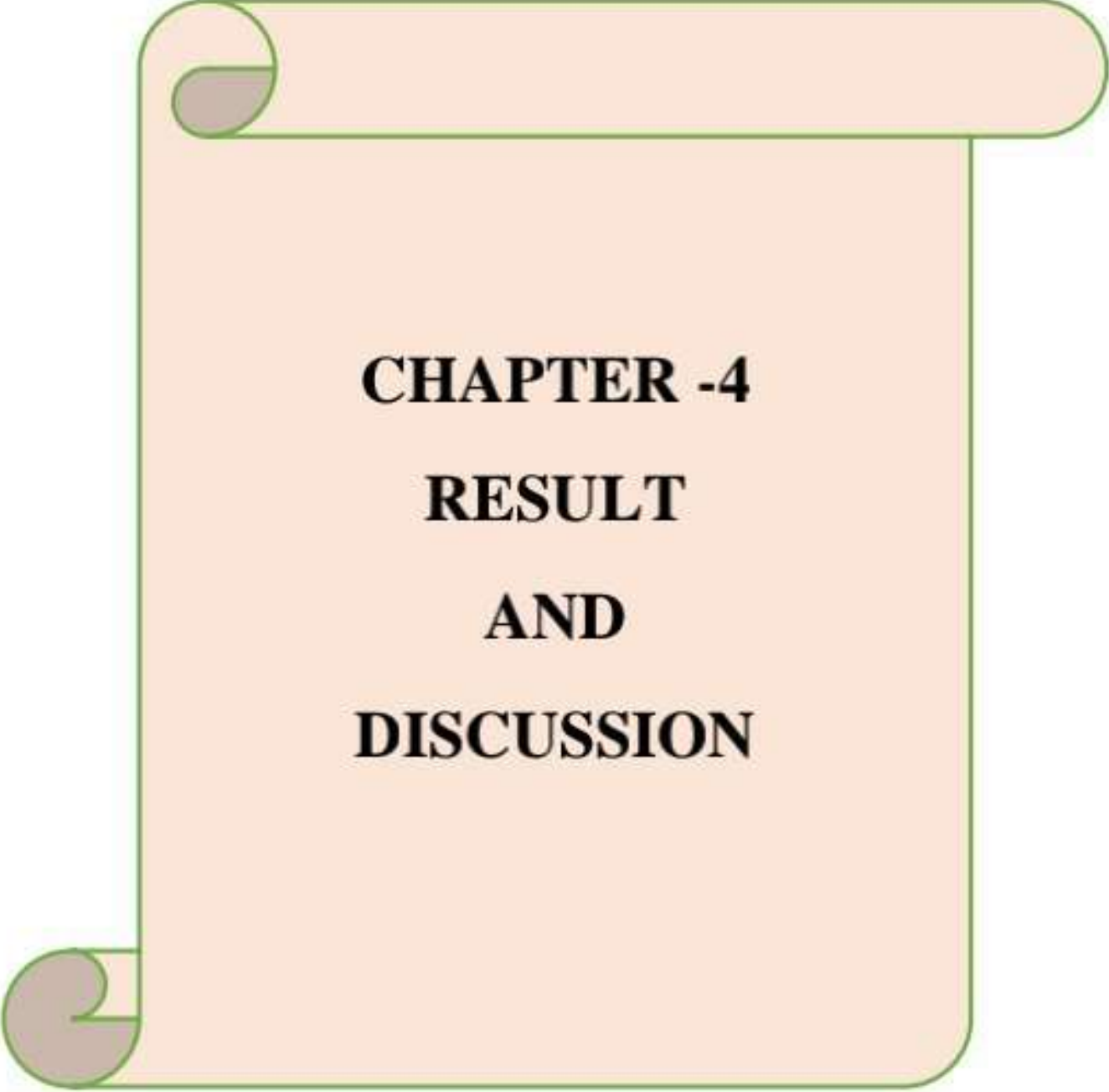
One set of Sterile nutrient agar plate & sterile potato dextrose agar plate was exposed directly to air by opening the lid of plates for 10 min at decided locations before exposure to dhoop. Another set from each area was exposed to air and then immediately to dhoop for 20 min in closed chamber. Later these plates along with set of plates not exposed to dhoop were incubated at room temperature for 24hrs, 48hrs, 72hrs(6). After incubation pre-exposure and post-exposure to dhoop colony count was recorded as shown in table no.3.1 to 3.8 and fig no 4.1 to 4.6.

Weight of stick - 9.9 gm

Size of dhoop stick - 4 cm

4) Sensory analysis :

A survey was also carried out in order to evaluate the acceptability of the organic dhoop amount some people various parameters such as smell, appearance and smoke were evaluated.(7)(9). shown in table no.4



CHAPTER -4
RESULT
AND
DISCUSSION

4.0 RESULT AND DISSCUTION:

From the table no. 3 It can be well understood that our prepared organic dhoop successfully shows intended antimicrobial activity. It was prepared by above mentioned procedure. And was evaluated by observing its inhibitory action on aero micro flora.

Thus, when we compared colony count of plate pre exposed and post exposure to dhoop, the reduction in colony count way observed in plate exposed to dhoop. This can help to predict antimicrobial activity of organic dhoop stick.

Since we tried it in laboratory more sticks were used. However, in homes less stick can give appreciable result and help to reduce and control microbial flora of air

During survey most volunteers found smell of dhoop appreciable most of them did not experience any irritation in their eyes. All of them found acceptable appearance of it and accepted that they would like to use recommended the dhoop as it had proven to have antimicrobial activity.

❖ Details of the ingredients of organic dhoop

The weight of each component of organic dhoop was determined by using digital weighing balance and its values are given in the following table.

Table no. 1: Details of the ingredients of organic dhoop

Sr. no	Ingredients	Quantity	Activity
1	Cow dung	40 gm	For binding
2	Cow urine	2 ml	
3	Cow ghee	5 ml	Proper burning
4	Loban	4 gm	Antiseptic, antidepressant
5	Eucalyptus leaves powder	4 gm	Killing microorganism
6	Camphore leaves powder	4 gm	Anti flue agent
7	Bay leaf powder	4 gm	
8	Garlic peels powder	4 gm	Anti inflammatory
9	Saw powder	4 gm	Tight binding and proper burning
10	Lavender oil	10 ml	For fragrance
11	Neem oil	10 ml	Anti mosquito repellent
12	Coconut husk powder	2 gm	Proper burning
13	Honey	10 ml	Stickiness
14	Coconut oil	5 ml	Dilution solvent

❖ Antimicrobial activity:

The antimicrobial activity of each component of dhoop was determined by agar well method and zone diameter was measure. Its details are given in the following table.

Table no. 2 : Diameter of Antimicrobial activity

Organism	Component	Zone of Inhibition (in cm)
<i>E.coli</i>	Eucalyptus leaves	1.1
	Bay leaf	1.0
	Garlic peel	No zone
	Camphor leaves	1
<i>Staphylococcus aureus</i>	Eucalyptus leaves	1.5
	Bay leaf	1
	Garlic peel	1.2
	Camphor leaves	1.5

❖ **Evaluation of organic dhoop for antibacterial and antifungal activity**

Table no. 3: 1ST SAMPLING FOR OPEN AREA

Table no. 3.1 Colony count of Pre-exposure plates on NA medium

Area	Colony count of NA		
	24hrs	48hrs	72hrs
Laboratory Entry	9	67	120
Mid area of laboratory	8	37	45
Cupboard	4	54	38
Near basin in laboratory	3	72	30

Table no. 3.2 Colony count of Post-exposure plates on NA medium

Area	Colony count of NA		
	24hrs	48hrs	72hrs
Laboratory Entry	15	30	120
Mid area of laboratory	8	39	45
Cupboard	16	35	38
Near Basin in laboratory	13	26	30

Table no. 3.3 Colony count of pre-exposure plates on PDA medium

Area	Colony count of PDA		
	24hrs	48hrs	72hrs
Laboratory Entry	1	13	19
Mid area of laboratory	3	13	30
Cupboard	0	16	23
Near basin in laboratory	1	10	20

Table no. 3.4 Colony count of Post-exposure plates on PDA medium

Area	Colony count of PDA		
	24hrs	48hrs	72hrs
Laboratory Entry	0	14	15
Mid area of laboratory	3	28	18
Cupboard	3	13	17
Near Basin in laboratory	3	18	15

FOR 2ND SAMPLING FOR CLOSE AREA

Table no. 3.5 Colony count of Pre-exposure plates on NA medium

Area	Colony count of NA		
	24hrs	48hrs	72hrs
Laboratory Entry	0	120	170
Mid area of laboratory	9	18	24
Cupboard	0	22	44
Near Basin in laboratory	8	17	21

Table no. 3.6 Colony count of post-exposure plates on NA medium

Area	Colony count of NA		
	24hrs	48hrs	72hrs
Laboratory Entry	3	11	16
Mid of laboratory	0	1	8
Cupboard	1	7	11
Near Basin in laboratory	0	4	11

Table no. 3.7 Colony count of pre-exposure plates on PDA medium

Area	Colony count of PDA		
	24hrs	48hrs	72hrs
Laboratory Entry	4	21	27
Mid of laboratory	0	20	28
Cupboard	3	23	24
Near Basin in laboratory	0	32	60

Table no. 3.8 Colony count of Post-exposure plates on PDA medium

Area	Colony count of PDA		
	24hrs	48hrs	72hrs
Laboratory Entry	0	7	7
Mid of laboratory	0	3	17
Cupboard	1	3	5
Near Basin in laboratory	0	3	3

Table no.4: Areas For Antimicrobial Activity

Sr. no.	Area	Time of exposure
1	Laboratory Entry	10 minutes
2	Mid Area Of Laboratory	
3	Cupboard	
4	Near Basin In Laboratory	

Table No. 5 : Sensory Testing of Dhoop

Sensory testing of dhoop was performed by 10 untrained persons for smell, acceptability with respect to smoke, area of handling and product recommendation.

Sr. No	Questions	Yes	No
1	Is the smell appreciable	10	00
2	Smoke is irritating	01	09
3	Use the product at home	10	00
4	Will you recommend the product	10	00
5	Ease of handling	10	00
6	Is product ecofriendly	10	00

List of photographs:

PHOTOGRAPH NO. 1: INGREDIENTS OF DHOOP



Fig. No.1.1 *Lavender oil*



Fig. No.1.2 *Camphor leaves*



Fig. No.1.3 *Eucalyptus leaves*



Fig. No.1.4 *Bay leaf*



Fig. No.1.5 *Loban*



Fig. No.1.6 *Taget erecta and Garlic peels*



Fig. No.1.7 Neem oil



Fig.No.1.8 Honey



Fig. no.1.9 Coconut husk powder

PHOTOGRAPH NO.2: ASSEMBLY OF DHOOP



Fig. No. 2.1 Mixing



Fig. No.2.2 Mulching and Mashing



Fig. No. 2.3 Prepare a Dough



Fig. No. 2.4 Prepared Dhoop sticks

**PHOTOGRAPH NO. 3 : ANTIMICROBIAL ACTIVITY OF EACH
DHOOP INGREDIENT**



Fig. no. 3.1 Zone of Inhibition



Fig. No. 3.2 Zone of Inhibition



Fig. No. 3.3 Zone of Inhibition

PHOTOGRAPH NO.4 : COLONY COUNT OF PLATES

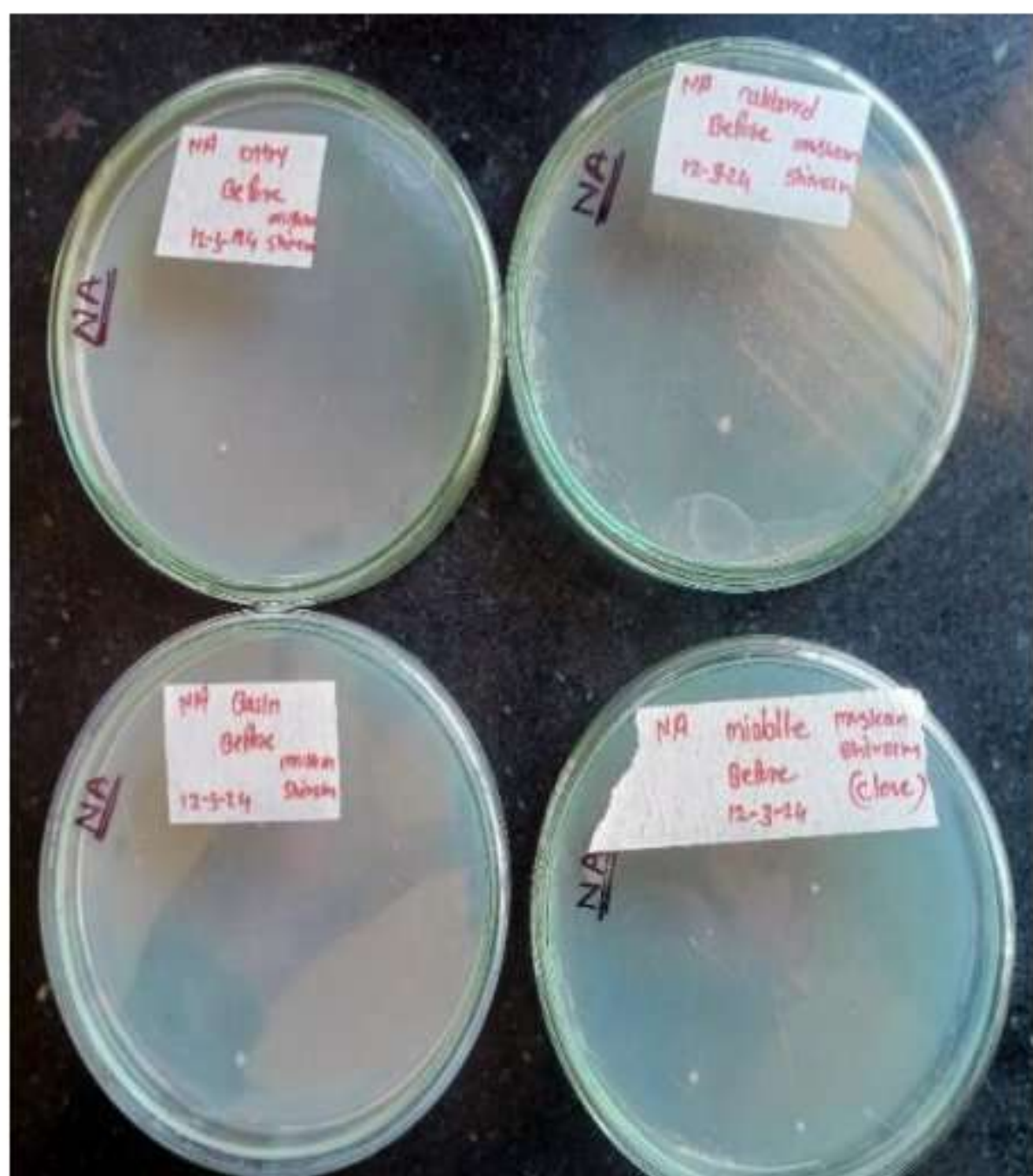


Fig. No.4.1 24hrs Pre-exposure plates

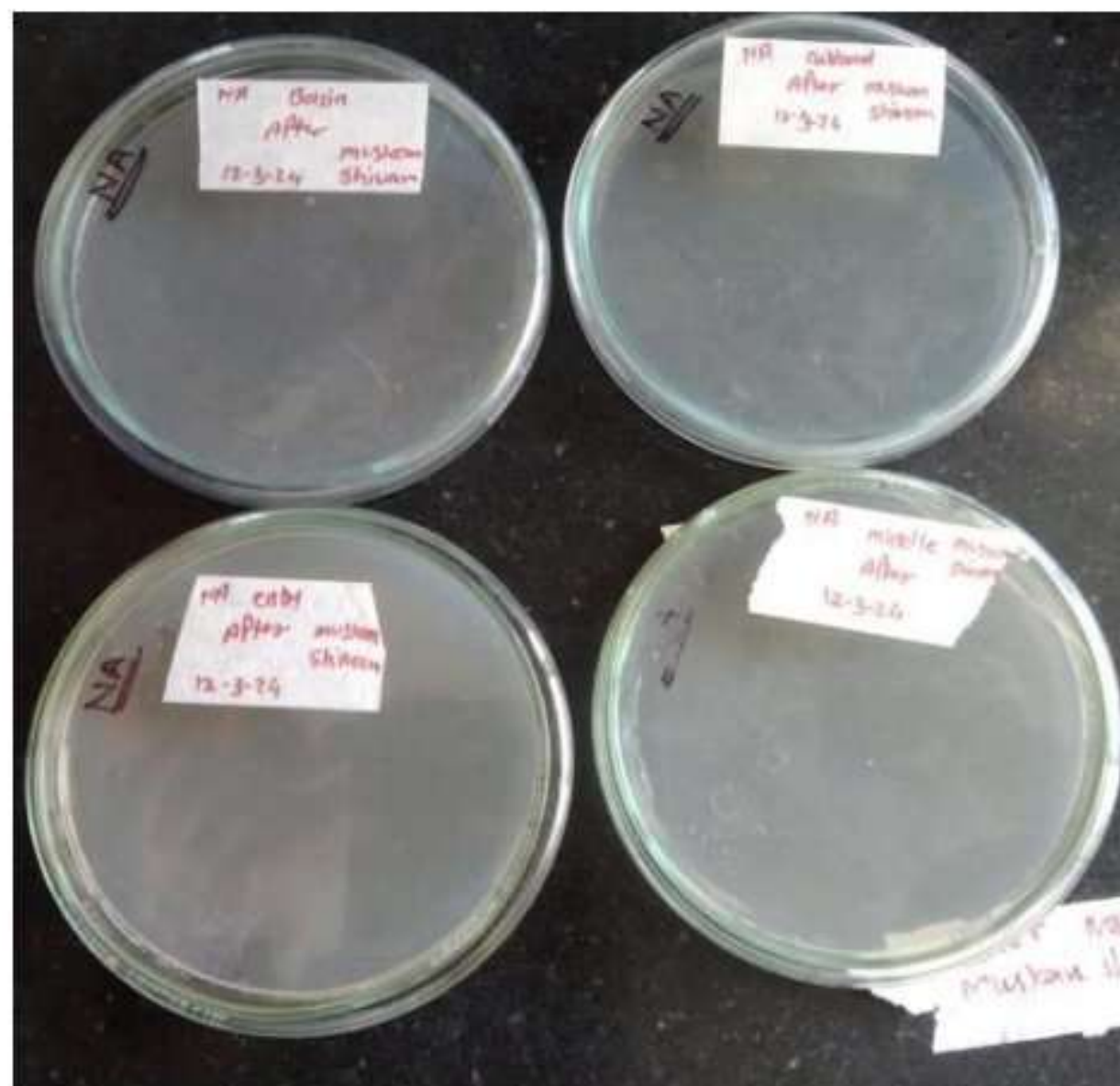
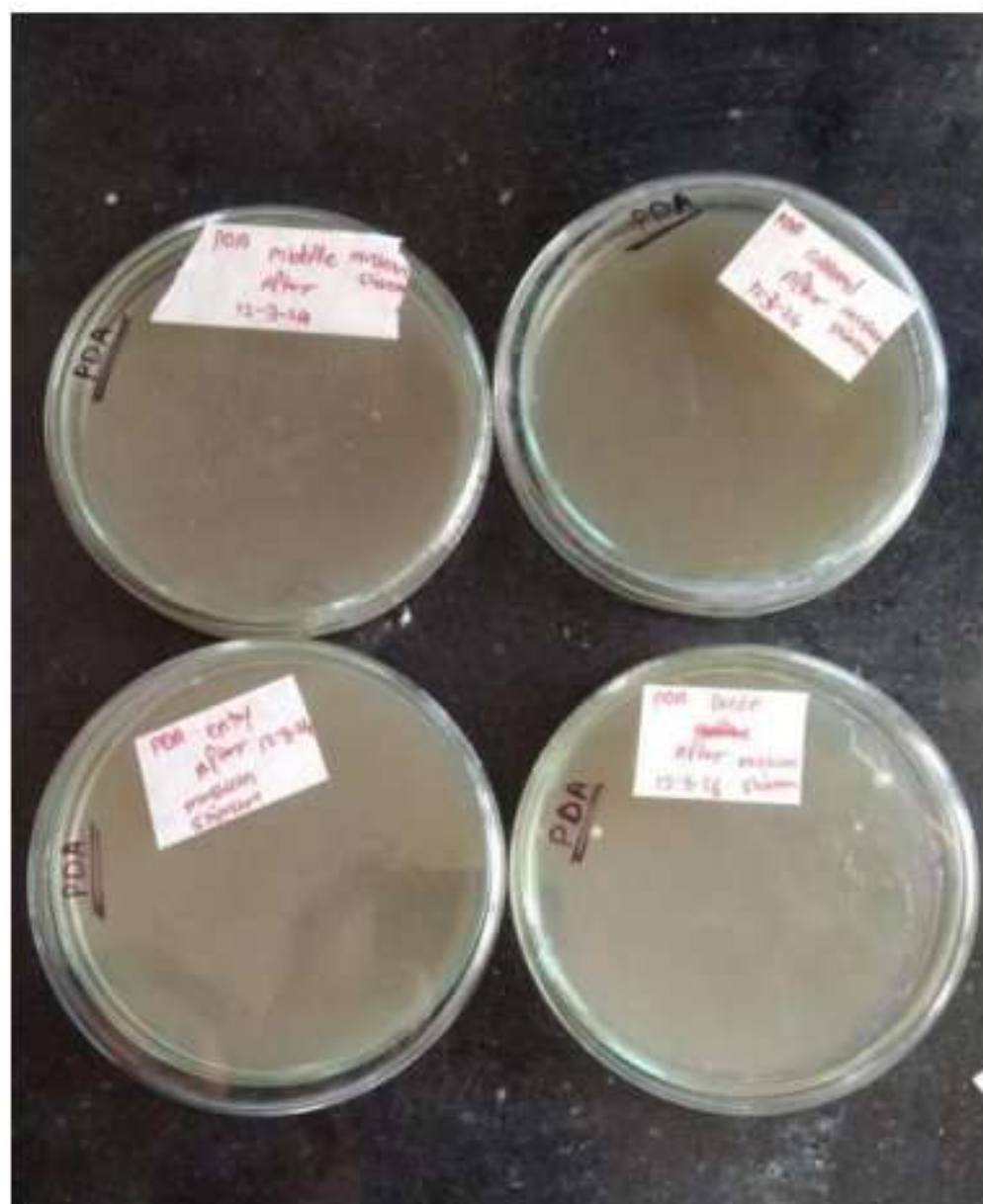


Fig. No.4.2 24hrs post-exposure plates

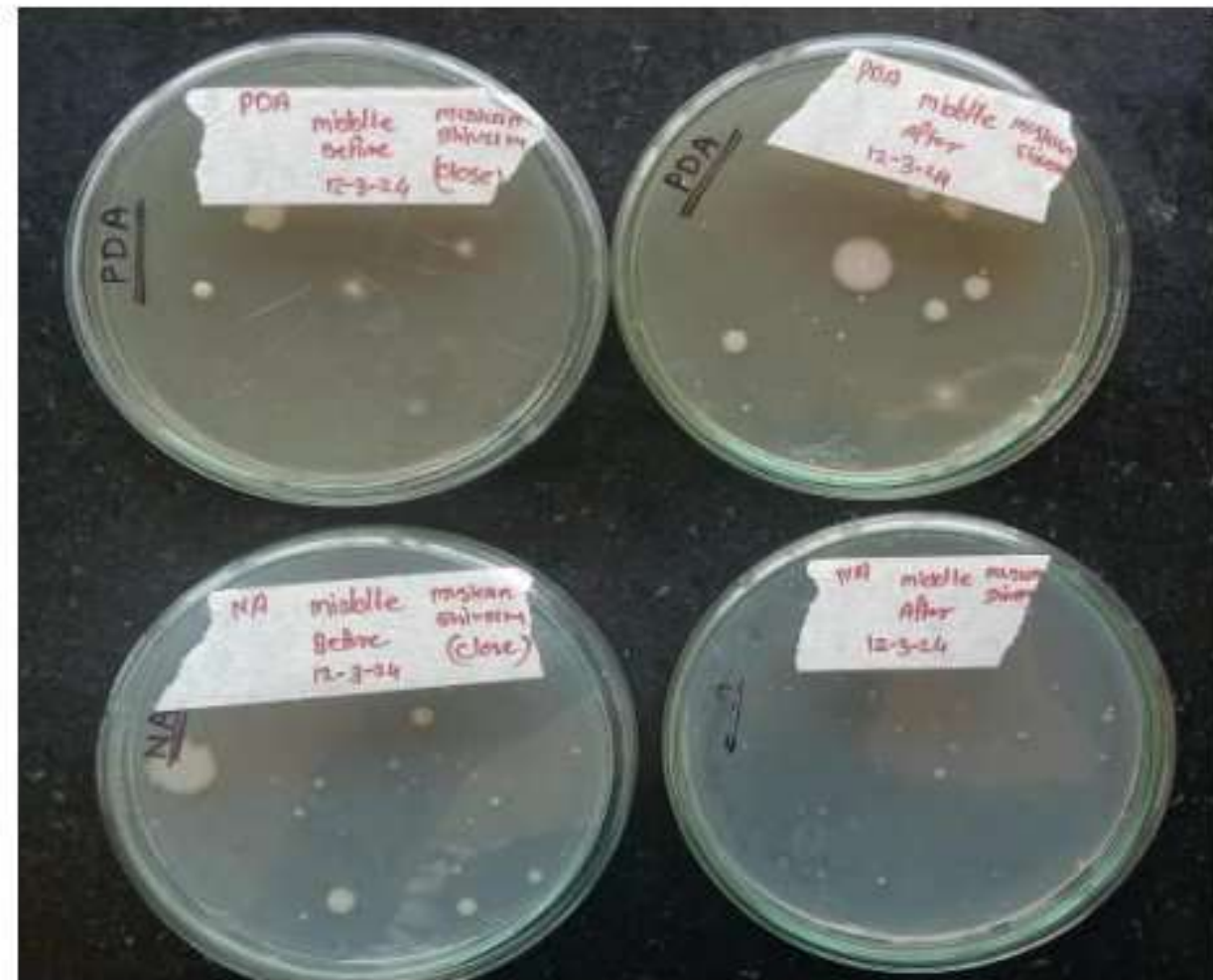
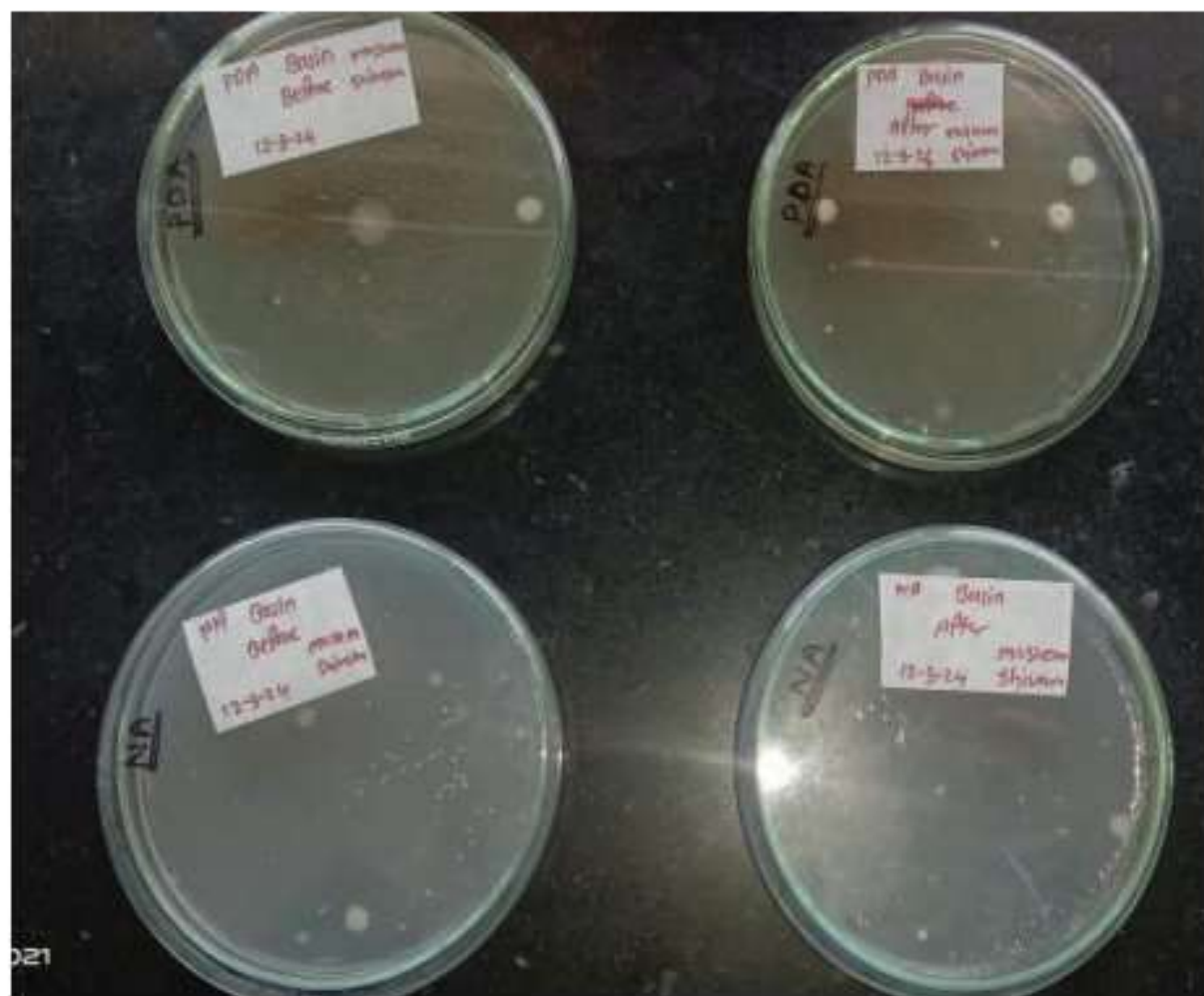


Fig. No.4.3 48hrs pre -exposure plates

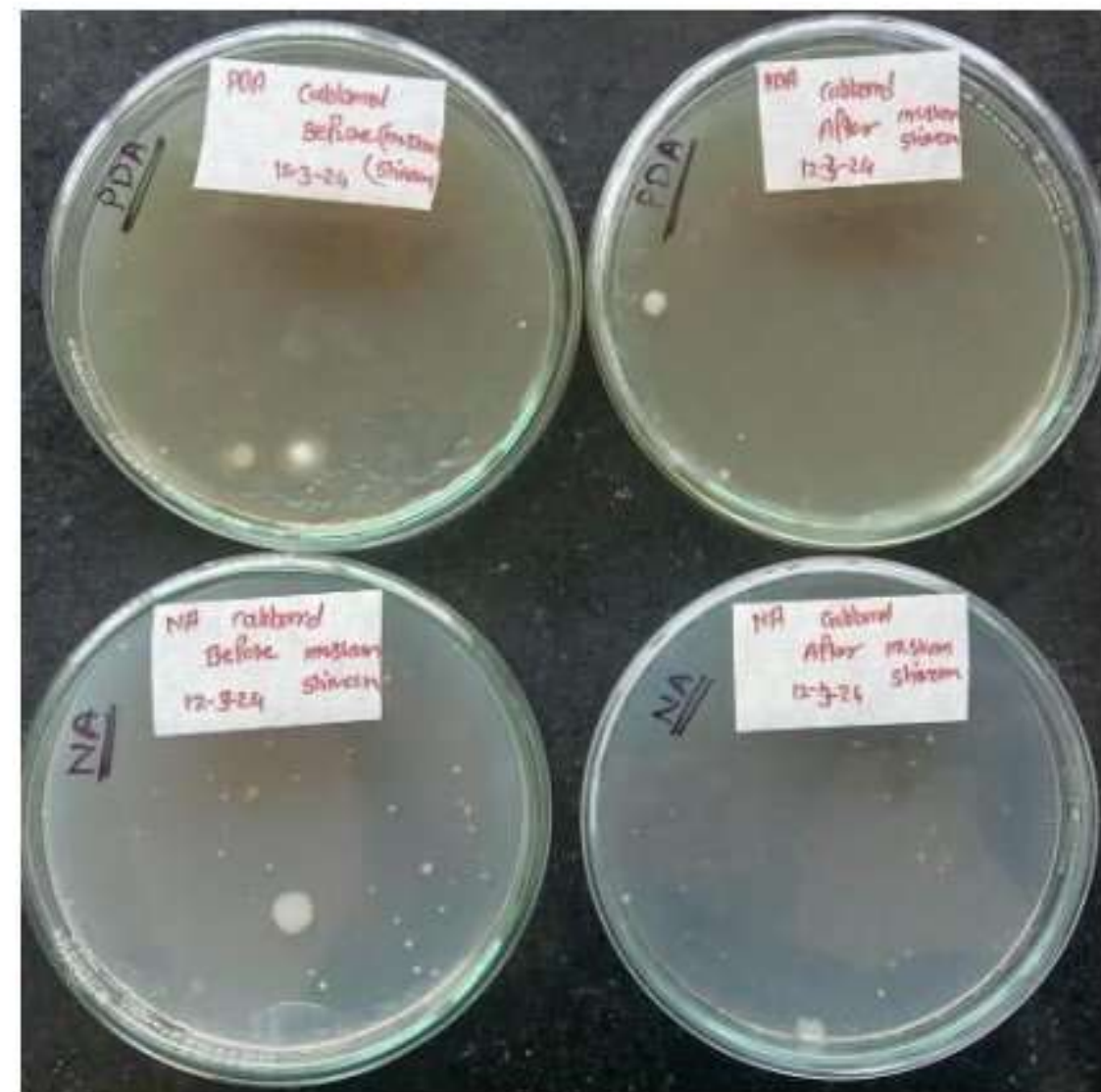
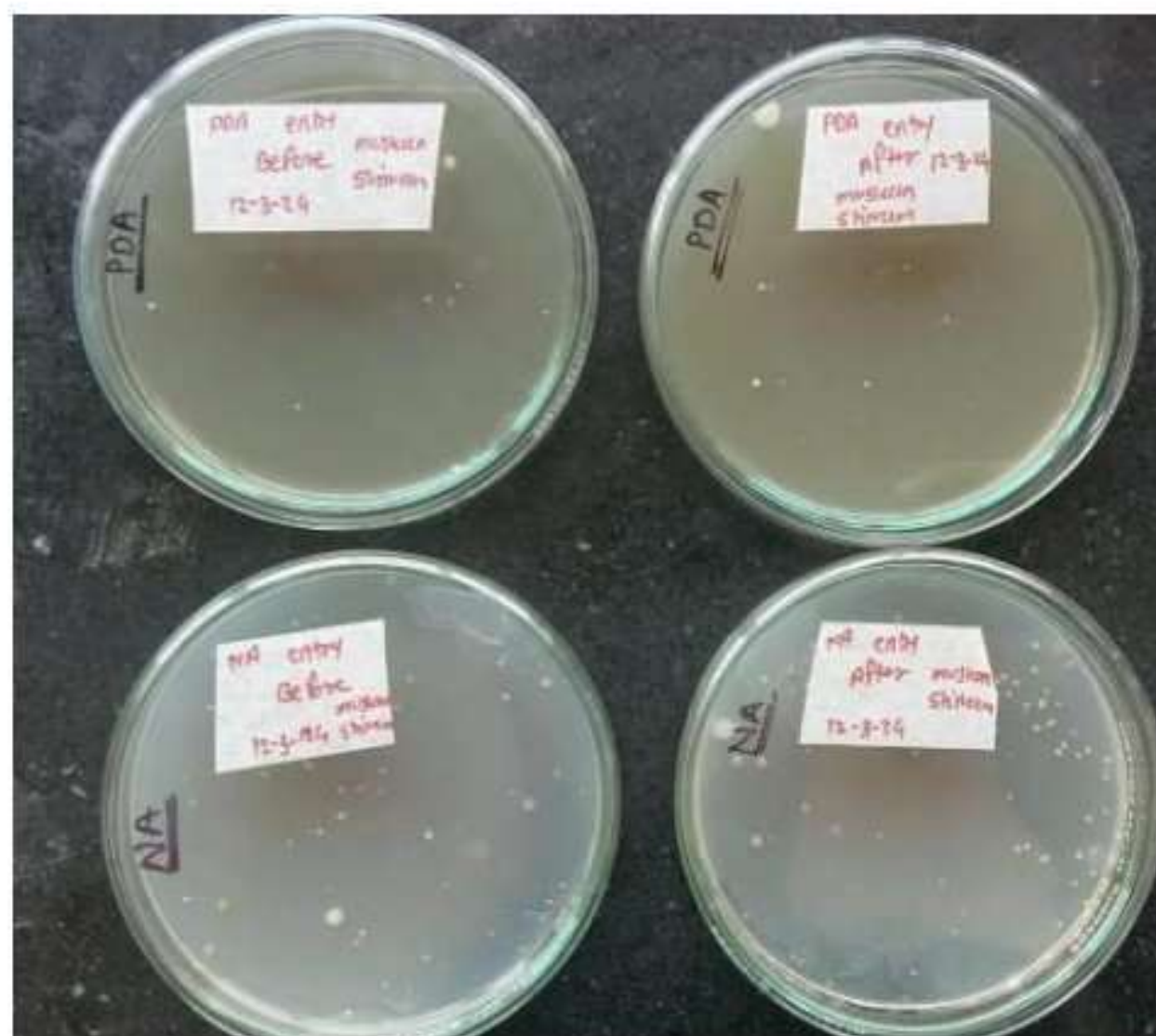


Fig. No.4.4 48 hrs. post-exposure plates

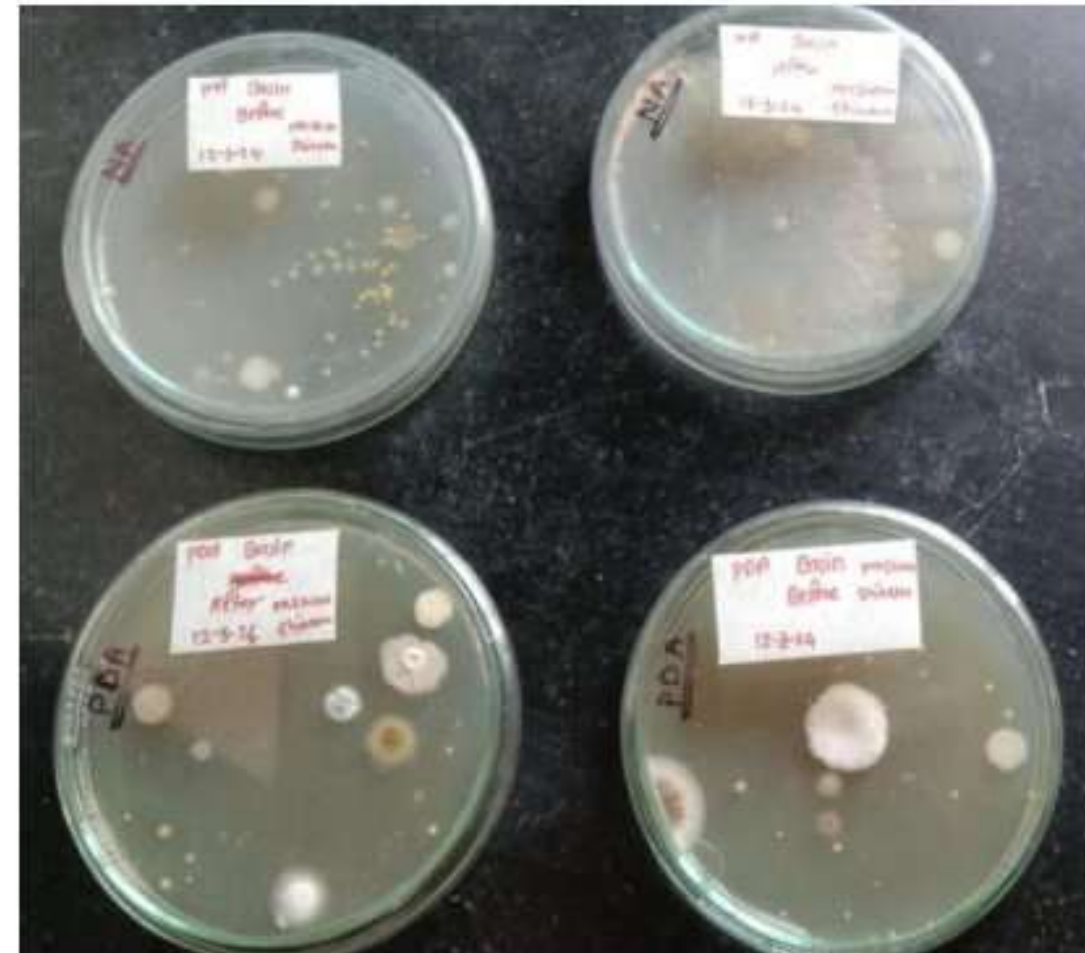
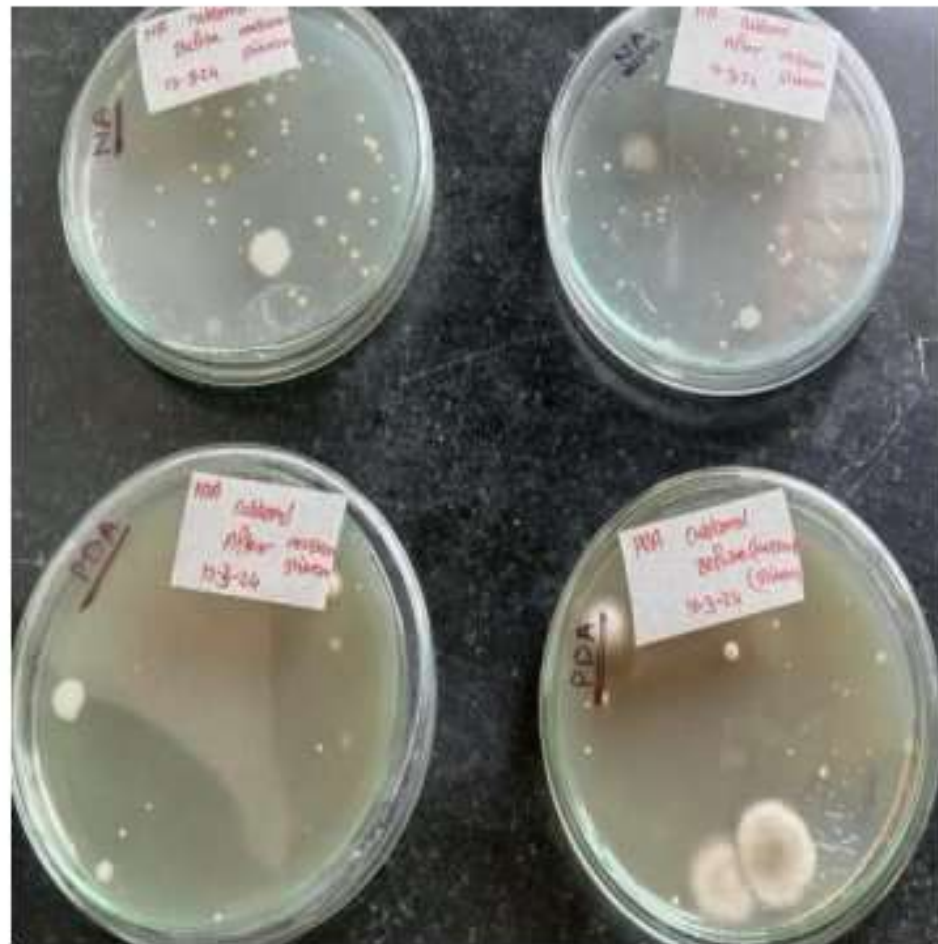
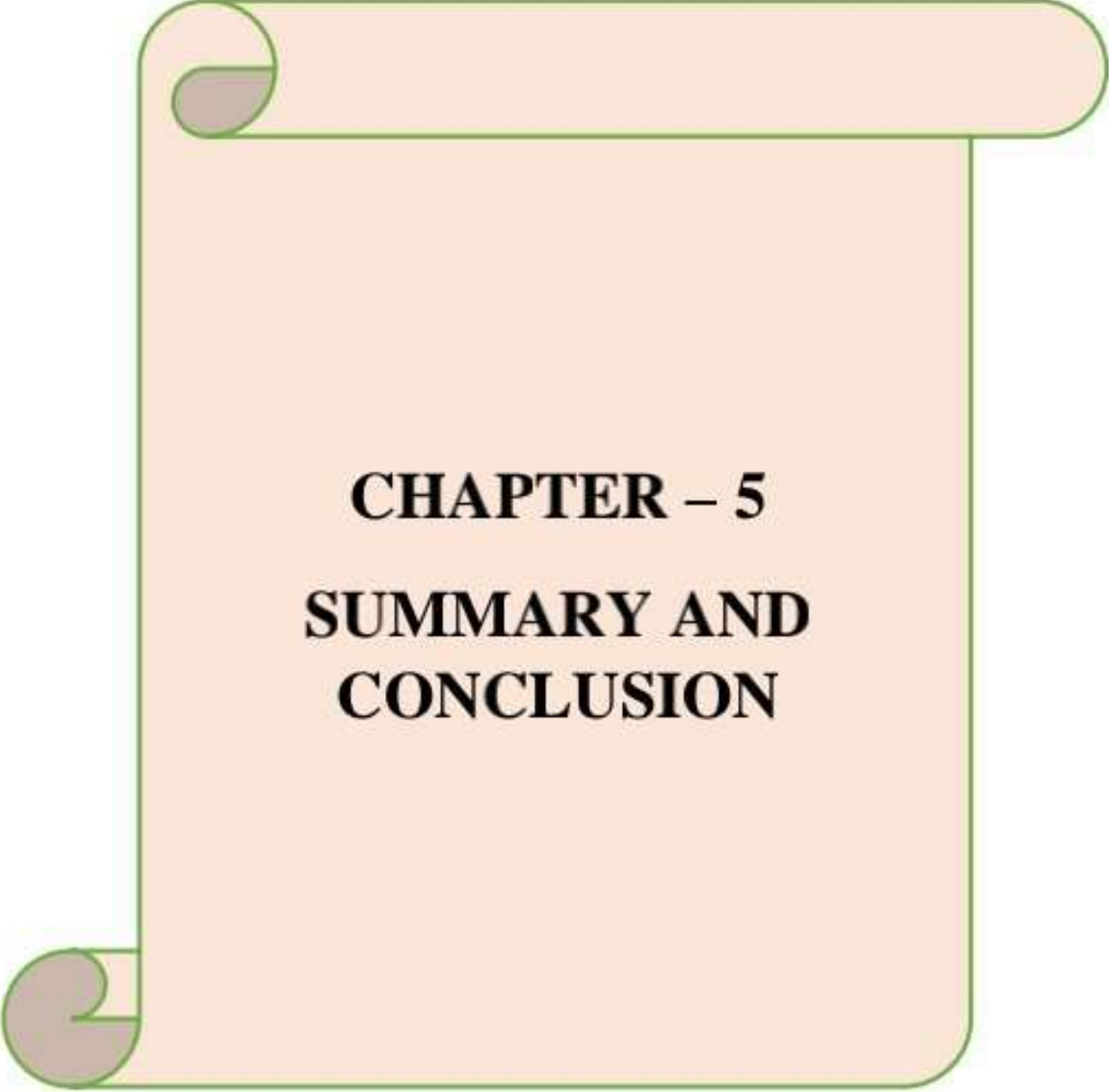


Fig. no.4.5 72 hrs pre-exposure plates



Fig. No.4.6 72hrs. post-exposure plates



CHAPTER – 5
SUMMARY AND
CONCLUSION

0.5 SUMARRY AND CONCLUSION

There are different types of incense which shows different healing properties. Hence in present study we focused on preparing organic dhoop and its antimicrobial activity.

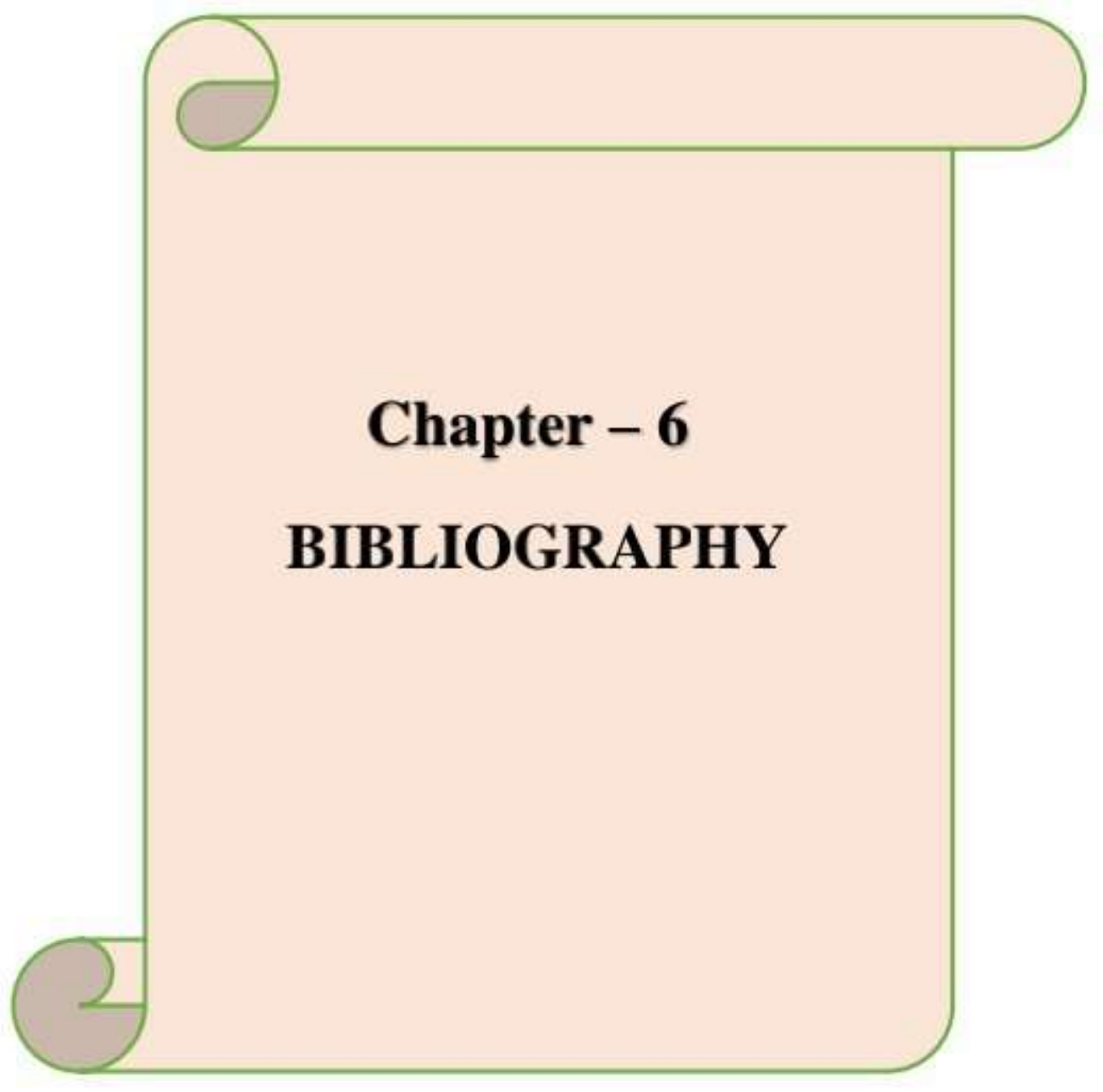
All the plant material i.e. flower, bay leaf, eucalypts leaves, camphore leaves, were air dried and grind fine powder. Cow ghee, Cow dung, cow urine, taken in clean plate and added all plant powders. Mix well properly mash the all material and prepare a dough. Added essential oil, neem oil, lavender oil, honey, loban powder, coconut husk powder macerated in the form of dough. By using a plastic piece of pipe as a mold and prepared dhoop sticks.

The samples were prepared using each component of dhoop including nilgiri leaves powder, camphore leaves powder, bay leaf powder, garlic peels powder and neem oil. 2 gm powder of each of these components was mixed in 10 ml sterile distilled water separately followed by stirring on rotary shaker overnight.

The antimicrobial activity of each component of dhoop sticks was studied by agar well method. In this method the effect of each component of dhoop stick was studied against Gram-negative bacteria *E. coli* and Gram-positive bacteria *Staphylococcus aureus*.

To check activity of dhoop against bacteria and fungi in open and closed cabinet area, the sterile nutrient agar and potato dextrose agar medium plates were kept open in different 4 areas of Microbiology laboratory for 10 minutes for adsorption of bacterial cells and fungal spores. After 10 minutes plates were incubated at room temperature and 37⁰C for 24 -72 hours. The dhoop was burned in same area till its complete combustion. The after sterile nutrient agar and potato dextrose agar medium plates were kept open in same 4 areas of Microbiology laboratory for 10 minutes for adsorption of bacterial cells and fungal spores followed by incubation at room temperature and 37⁰C for 24 -72 hours. After incubation the colony count on pre-exposed and post exposed plates was compared. From observation it was clear that the load of microorganism was satisfactorily decreased.

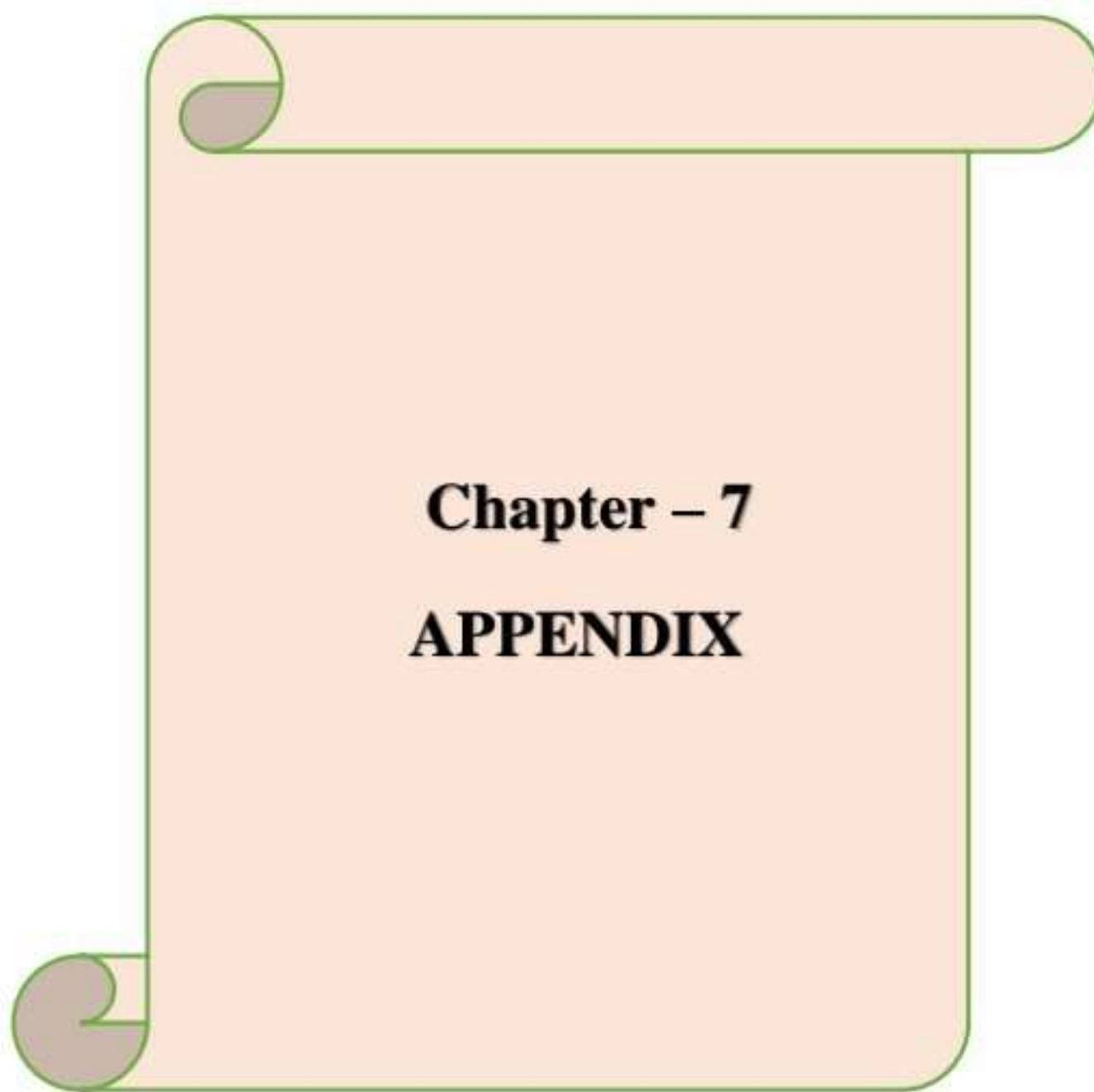
All the results obtained through experiments were as per the aims and objectives decided before beginning of present study.



Chapter - 6
BIBLIOGRAPHY

0.6 BIBLIOGRAPHY

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0.7 APPENDIX

❖ Nutrient agar:

Composition:

Peptone: 0.5 gm

Meat extract / yeast extract: 0.3gm

Sodium chloride: 0.5gm

Agar: 2gm

Distilled water :100 ml

pH :7 to7.2

❖ Potato dextrose agar:

Composition:

Potato :20gm

Dextrose: 2gm

Agar: 1.5gm

Distilled water: 100ml

pH: 5.6