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Preparation And Evaluation Of Herbal Mosquito Repellent Cream

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Abstract *: Nowadays Majority of the disease or infection like malaria, dengue etc. caused by the different types of mosquitoes mainly female Anopheles mosquito to prevent these infection or diseases there are multiple synthetic pesticides are used in market .*
The various pesticides used as a mosquito repellent containing hazardous chemicals that causes the various health problems in humans and other living creatures , that pesticides also cause the environmental pollution by considering these facts we are here with mosquito repellent without hazardous chemicals know as ***HERBAL MOSQUITO REPELLENT CREAM***
As the herb are easily accessible in our society , it is very beneficial to use these Holly herbs in mosquito repellent formulations
The herbs are the core substance in our formulations ,there are different active constituents such as alkaloids ,fixed oils, essential oil, resins flavonoids ,phenols etc. . Which is present in specific parts of herbs as it is extracted by various methods like steam distillation, pressing techniques, solvent evaporation etc.
The current paper summerizes research with aimed of developing the safe and effective herbal mosquito repellents . Our study aim at the investigating the herbs which has mosquito repellent activity but they does not causes the health hazard ,environmental hazard and pollution, those herbs which have Mosquito repellent activity which are used in specific proportion depending on there mosquito repellent activity in herbal mosquito repellent formulation and formulations have been developed .

INTRODUCTION:-

A mosquito repellent is a substance that deters mosquitoes from approaching or settling. Repellents are formulated for use on bare skin.They are sold as aerosols , creams , solids(sticks) ,pump Sprays and liquids. ▪ Nowadays majority of serious diseases or infections are caused by mosquitoes mainly female anopheles mosquito like Malaria, Dengue, Chikungunya, Lymphatic Filariasis , Zika , etc. ▪ (5) MALARIA: Malaria is an arthropod borne disease caused by plasmodium parasite (P.vivax , P.falciparum , P.malariae , P.ovale) transmitted by the infected mosquito. Major Vector : Anopheles stephensi , A. culcifacies. ▪ DENGUE: Dengue (break-bone-fever) is a viral infection caused by flavi virus(DEN-1,DEN-2,DEN-3,DEN-4)serotypes. Major Vector: Aedes egypti , Aedes albopictus. CHIKUNGUNYA: Chikungunya ia an illness caused by a virus called chikungunya.Transmitted to people through the bite of infected mosquito Major Vector:Aedes albopictus,A.aegypti.(1) ▪ LYMPHATIC FILARIASIS: This disease is caused by filoriadea type round worm parasite (Wucheresia bancrofti). Major Vector: Anopheles culex , Aedes and Monsonia.(2) ▪ ZIKA VIRUS: Zika virus is a mosquito-brone virus associated with a birth defect called microcephaly.Major Vector: Aedes aegypti , Aedes albopictus.(3)(4) Dizziness Nausea and Vomiting Breathless Itching and Rash To prevent this disease there are multiple conventional Synthetic Mosquito Repellent in Market.This synthetic formulations consist of various hazardous chemicals that causes various acute and chronic health problem in humans and may lead to environmental pollution.

HARMFUL EFFECTS OF CHEMICALS IN MOSQUITO USED REPELLENTS :-

Chemicals	Problems Associated
DEET	Neurological issues, Scarring in adults
PICARDIN	Inhalational toxicity , Eye Irritation
SCOURGE	Liver and Thyroid Problems
ANVIL	Boost Tumor growthin Cancer
MALATION	Acute and Chronic Neurological Problems
IR3535	Toxicity on oral ,dermal,inhalational exposure
PARA-METHANE-DIOL	Eye and face irritation
METOFLUTHRIN	Neurotoxicity
PERMETHRIN	Irritation to (Nose,lungs,throat), Headache ,Fatigue, Excessive Salivation ,Dizziness.

HARMFUL EFFECTS OF CHEMICALS IN MOSQUITO USED REPELLENTS

HERBS USED IN MOSQUITO REPELLENT CREAM :-

1. **NEEM :-**
   - Biological Name :- Azadirachta Indica (6)
   - Common Name:- Nim, Margosa (7)
   - Biological source:- The oil of neem is an Glyceridic oil which is obtained from the continuous pressing method of the seed of species Azadirachta Indica
   - Family :- Meliaceae
   - Chemical constituents:- Azadirachtin And others are nimbolinin , nimbin, nimbidin, nimbidol, sodium nimbinate, gedunin, salanin and quercetin, oleic, linoleic acid.(8)
   - MOA:- Azadirachtin is an chemical constituents of the neem which is act as anti-ecdysteroid and it kill the larvae by the cell wall disruption Azadirachtin is tetranortriterpenoid limonoid present in seed . It is key constituents for the mosquito repellent as well as the antifeedant .
   - Method :- a) Three percent of neem oil mixed with the coconut oil gives approximately 90-95% of the protection from the Anopheles mosquito, 80% From the Aedes and 60-90% from Culex spp. b) Take 10-12 drops of neem oil and 20ml of coconut oil to glass spray bottle, mix gently and apply over required areas. Duration of the protection is approximately 2-4 hours .
2. **Lemon Grass Oils :-**
   - Biological Name:- cymbopogon nardus and cymbopogon Winterianus
   - Common Name:- lemon grass,silky heads,Cha de Dartiga longue,fever grass,tanglad,hierba Luisa,barbed wire grass or gavati chaha.
   - Biological Source:- The oil of citronella is an essential oil which is extracted from the leaves(grasses) by steam distillation. Two types of citronella oil:- 1.Ceylon- extracted from the species C.nardus 2.Java- obtained from the species C.winterianus. Family:-poaceae • Chemical Constituents:- citronellal,geraniol,citronellol,geranyl acetate.(10)
   - MOA:- The citronella oil consists of geraniol and citronellol which gives an citrusy like aroma that masks up the environmental cues(factors) like carbon dioxide and lactic acid due to which mosquitoes get confused to sensitize the cues by its olfactory sensory organ so they are unable to deter from getting close when such oil is applied over required surface area (9)
   - Method:- Steam distillation,water distillation (a)combine one part of nard (citronella leaves /grasses and 10 parts of olive oil (b)steam heat(cook) the above mixture (c)strain out in a glass spray bottle with the help of cloth (d)seal the bottle and use on required

3. Clove :-

- Biological Name:- syzygium aromaticum
- Common Name:- clove, cengkin , chengken, chingken
- Biological source:- The oil of clove is an essential oil which is obtained from steam distillation method of the flower bud of the species syzygium aromaticum.
- Family:- Myrtaceae • Chemical constituents:- Eugenol, Caryophyllene , eugenyl acetate (11)
- MOA:- Clove oil consist of an effective mosquito repellent constituent known as Eugenol.The eugenol has an sharp peppery,woody odour which is offensive to mosquitos.Mosquito cant bear the burning sensation of clove oil.The odour affects the olfactory sensory organ present on the antennae of mosquito.Due to which mosquitos are unable to detect the host cues like carbondioxide,temperature,alcohol,body odour and simultaneously stays away from the host Eugenol when mixed with synergist chemical boost the effectiveness of repellancy and killing the larvae of mosquitos.(12)
- Method:-a)Clove oil (50 %) mixed with lavender,thyme or geranium oil (50%) prevent biting from An.abimanus for about 1 to 2 1/2 hrs. b)Clove contain eugenol having peppery odour when mix with sour flavour of lemon gives effective mosquito repellant property.

4. Basil :-

- Biological Name :- Ocimum sanctum,Ocimum basilicum L.
- Common Name :- French basil,Sweet basil,Tulsi,Great basil,Holy basil,Thai basil,Sacred basil. • Biological Source:- The basilicum oil is an essential oil which is obtained from the steam distillation of leaves and flower top of species ocimum sanctum and ocimum basilicum L. Family:- Labiatae
- Chemical Constituents:- limonene,linalool,eugenol,E-methyl cinnamate ,estragole,Fenchone,1- 8-cineole,nerolidol,citronella. (13)
- MOA:- Basil oil consist of four types of volatile compounds like citronella, limonene,estragole and nerolidol which reduce the ability of mosquitoes to locate the host by interrupting it's carbon dioxide and temperature sensors. Due to which mosquitoes gets confused to recognise the environmental cues and force them to leave recuperate their senses.
- Method:- Hydro distillation,steam distillation,solvent extraction,super critical fluid extraction. (a)A mixture of 60% basil oil with 40% of lavender or bergamot oil will give protection for approx 70 minutes. (b)Boil the basil leaves the cool it and strain it in a glass spray bottle for use over required area.(14)

5. Camphor Leaf :-

- Biological name :- cinnamomum camphora (L) J. Presl
- Common name :- camphora Officinarum, camphor wood, camphor laurel, Kapura (In Gujarat) , karpura (In bengal) , zhangnao(In China) ,
- Biological source:- The oil of camphor is an essential oil is synthesised from steam distillation of Timber (wood), leafage(leaf), bark of species cinnamomum camphor (L) J. Family:- lauraceae
- Chemical constituent :- sabinene, 1-8 cineole, Alpha terpineol, Alpha pinene, camphor, linalool
- MOA :- camphor oil encompass an lively substances that is 1,8-cineole, alpha-terpineol, alpha-pinene, linalool, Which lessen the capacity of mosquitoes to locate the host through interrupting it's Carbon dioxide and temperature sensors. Because of which mosquitoes gets harassed to recognise the environmental cues and pressure Them to go away recuperate their senses.
- Method:- steam distillation

OBJECTIVES:-

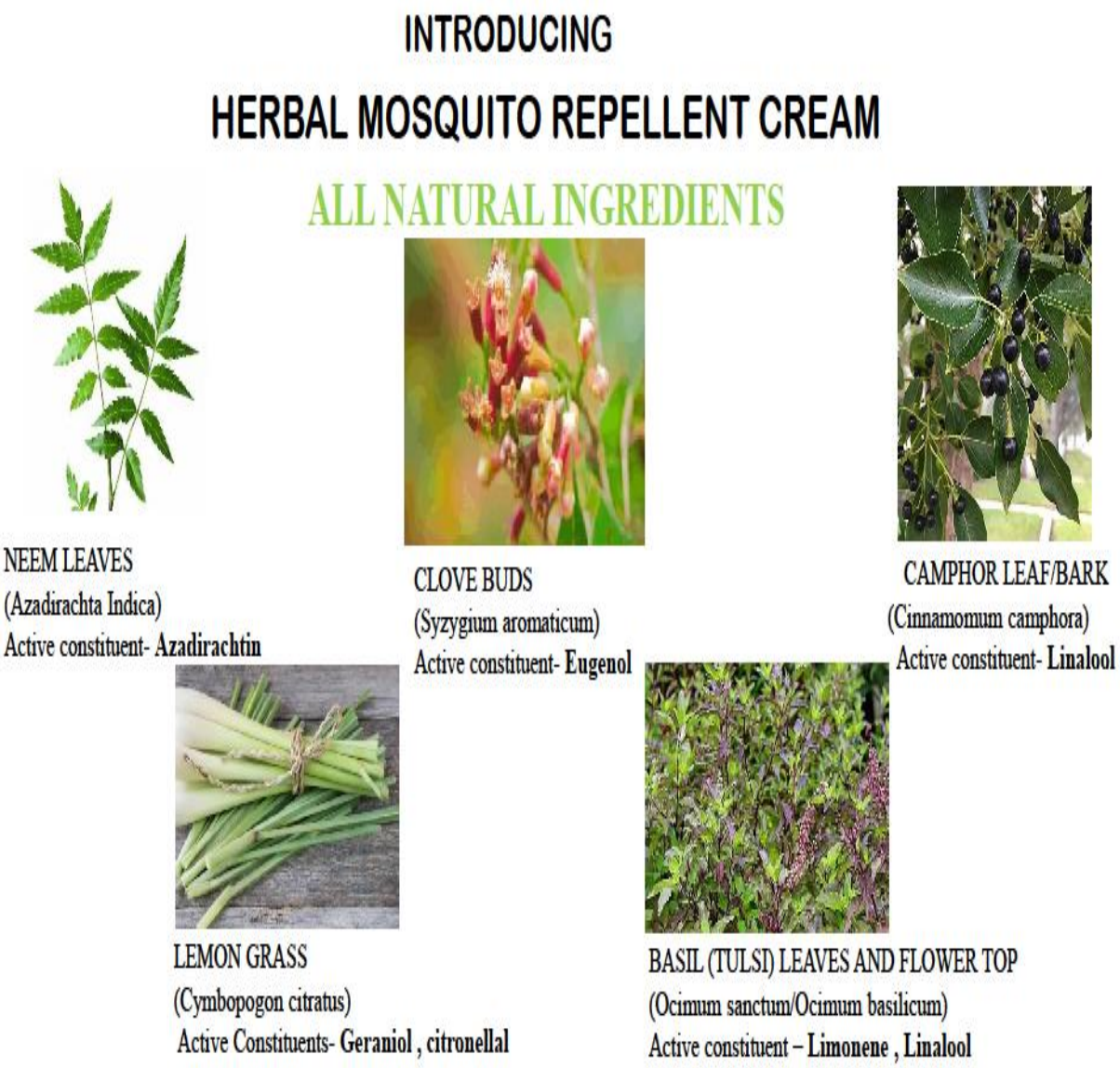
- ❖ Helps to protect against mosquitoes that spread malaria and other diseases such as dengue , chikungunya and yellow fever.
- ❖ To overcome disorders(Neurotoxiciy) caused by chemical synthetic mosquito repellent.
- ❖ To avoid side effects (itching , dizziness , rashes) caused by synthetic mosquito repellent.
- ❖ To use citronella and eugenol which is present in lemongrass and clove essential oils repectively which helps to mask the host cues such as (carbondioxide , lactic acid , body odour , temperature) on which mosquito rely for their target host.
- ❖ To develop mosquito repellent cream using essential oils from herbs (lemongrass , neem , clove , basil , camphor) having mosquito repellent activity.
- ❖ To evaluate the efficacy of herbal mosquito repellent cream.

Literature Survey :-

SR.NO.	AUTHOR	YEAR	TOPIC	STUDY
A.	A. O. Oyedele et al.	April 2002	Formulation of an effective Mosquito Repellants topical product from lemongrass oil .	Lemon grass oil is the essential oil obtained from the aerial parts of cymbopogon citratus (DC) Stapf. Family Poaceae. The plants has been widely recognised for its ethnobotanical and medicinal usefulness. The insecticidal ,antimicrobial and therapeutic properties pf its oil and extracts have been reported . the repellants are designed as topical preparations products that are able to protect the user or environment from harmful insects, such as mosquitoes, which tranmit diseases through their bite .
B.	Nassar A.. Awadah Ali et . al	October 2013	Pharmacological Activities Of Basil Oil	Basil is a well known aromatic Plants used for treatments of diseases. The therapeutic activity of basil is partly due to the presence of essential oils which possess a widespectrum of pharmacological effects.Camphor,Dlimonene, myrcene, thymol, are some of the compounds in Ocimum oils that may provide the repellent properties.
C.	Ibrahim SI et al	June2020	Mosquito repellent activity of leaf and seed extract of Azadirachta indica (Neem)	The present study was conducted to evaluate mosquito repellent activity of neem leaf and seed extract formulated in form of a cream against mosquito under laboratory conditions using human volunteers. Prevention of mosquito bites is one of the main strategies to control or minimize incidence of malaria Cream or lotion repellents are applied directly to the skin and rubbed in thereby creating a repellent barrier
D.	Sabira Begm et al.	November 2014	Mosquito repellents activity and toxicity of flower buds (clove) of Syzygium aromaticum Linn	Syzygium aromaticum commonly known as clove tree belongs to the family Myrtaceae. The plant has numerous medicinal properties.Its oil is a strong germicide contains eugenol which is an effective local anesthetic Repellent activity of essential oil of cloves has been reported earlier against mosquitos including Ae. Aegypti. In the present investigation mosquito repellent and larvicidal effects of S. aromaticum

				buds against 4th instar larvae of Ae. aegypti was assessed. This is the first report of repellent and larvicidal activity of the methanolic extract and its fractions against Ae. Aegypti
E.	Ranasinghe MSN et al.	2016	Development herbal mosquito repellent formulation	The present study was conducted to determine the mosquito repellent activities of some selected plant materials in order to obtain safe and efficient herbal mosquito repellent formulations by combinations of the selected plant materials.essential oil and mosquito repellent activity testing was carried out using arm-in-cage method. Tulsi leaf essential oil contains methyl eugenol (46-68%), (E)-caryophyllene (17-27%) and β-elemene (16.3%) as the major constituents.Clove essential oil is widely used and well known for its medicinal. properties. The major constituent in clove bud oils is eugenol
F.	Narayan Prasad Yadav et al.	14 october 2014	A Novel approach for development and characterization of effective mosquito repellent cream formulation containing citronella oil	Selection of ingredients was done according to their emulsification behavior. Various pilot batches of creams were prepared using a variety of oil phase ingredients. In order to get optimum consistency and property. Summarizes the general heuristics of mixing sequence and technique used for the preparation of cream.Depending on the product characterization and the performance test results, the product formula has to be revised .

G.	Yogesh V Ushir et al .	June 2022	Formulation and Development of herbal MosquitoRepellent Cream From Anisomeles Heyneana	The purpose of this study was to determine the herbal mosquito repellent activity of plant components like Anisomeles heyneanawas used to create safe and effective herbal mosquito repellent cream formulation. The cream's appearance, spreadability, irritancy test, viscosity, pH, and thermal stability were all investigated .



Herbs use in preparation mosquito repellent cream

METHODOLOGY:-

- ❖ Collection Of Herbs
- ❖ Extraction Of Oils From Herbs
  1. Collect Essential Part Of Herbs (leaves , buds , bark).
  2. Use coconut oil as a base solvent.
  3. Heat coconut oil on a water bath at constant temperature (approx 75 degree Celsius).

4. carefully add fresh essential part of Herb into coconut oil on a water bath.
5. Boil it at constant temperature until the leaves turn brown in colour.
6. Leaves or any other part of selected herbs contains active compounds such as (eugenol ,limonene , citronella , linalool)
7. Due to boiling these active compounds gets dissolved in base solvent oil thus , experience a characteristic smell.
8. Use a funnel to strain oil and a spoon to smash last bits of oil out of the leaves.
9. Discard the left over part (leaves).
10. Transfer oil to suitable container.

At Laboratory level Oils can be extracted by Steam Distillation (19)

Extraction Method Of Essential Oil From Herbs Having Mosquito Repellent Activity :

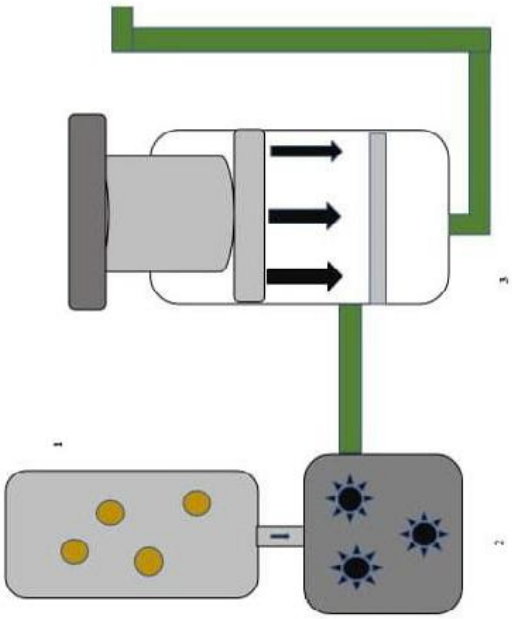


Figure 1 Cold Pressed Method

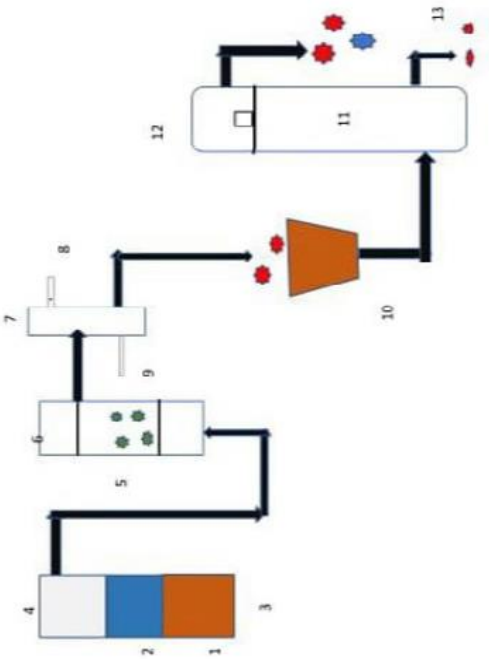


Figure 2 Steam Distillation (15) (16) (17)

1.Fire
2.water
3source
4.steam
5.Aromatic Plants
6.Steam Fixed with Essential Oil
7.Condenser
8.Hot water
9.Cold water
10.Water mixed with essential oil
11.Hydrolat (Aromatic water)
12. Separator
13. Essential Oil

PROPERTIES OF CREAM :-

- ❖ Colour:- Peach
- ❖ Odour:- Pleasant odour
- ❖ Appearance:- Light orangish pink
- ❖ Texture:- Smooth
- ❖ Weight:- 50 gm
- ❖ Emulsion:- W/O type emulsion.

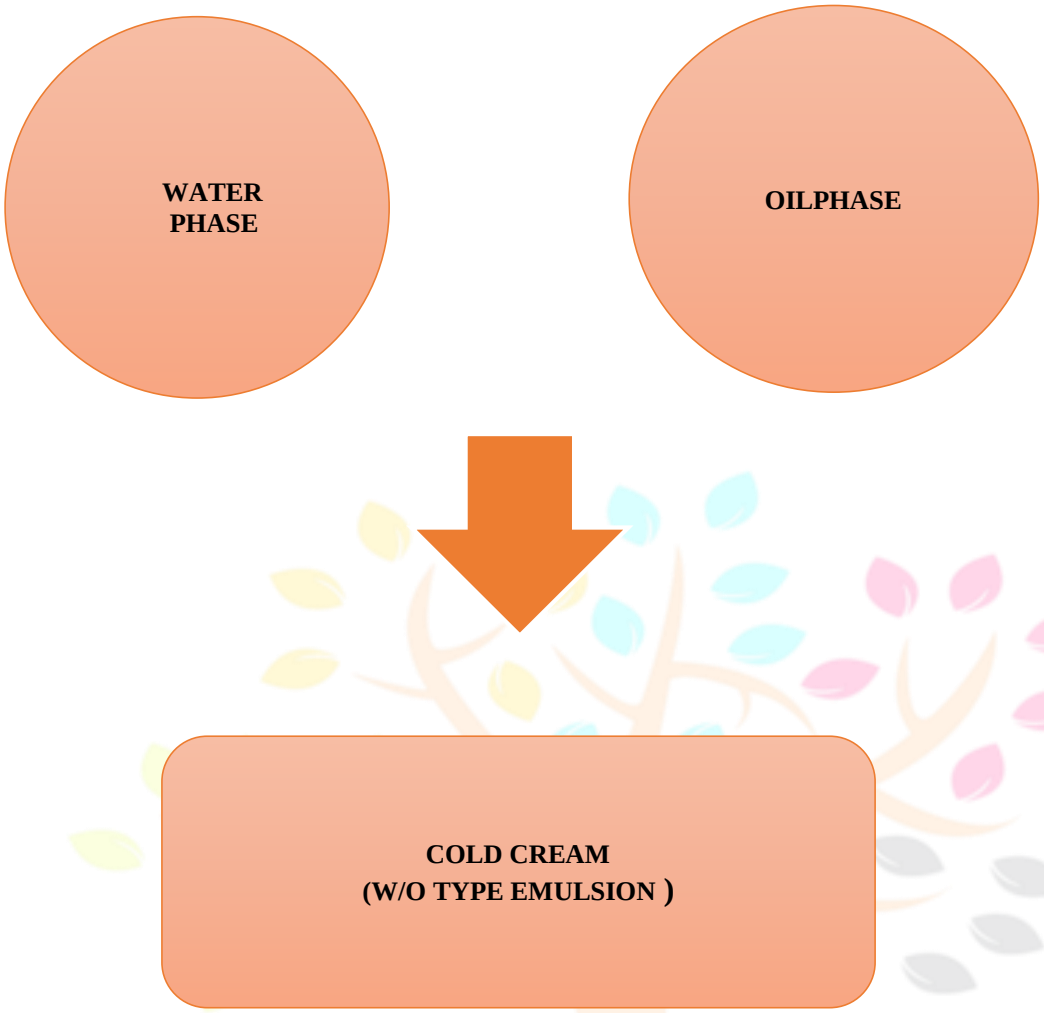
Formulation Table For 50gm Cream :-

Ingredients	Quantity	Role Of Ingredient
. OIL PHASE		
Neem oil	1.5 ml	Mosquito Repellent
Clove Oil	3 ml	Mosquito Repellent
Lemon Grass Oil	3 ml	Mosquito Repellent
Basil (Tulsi Oil)	2 ml	Mosquito Repellent
Camphor Oil	1.5 ml	Mosquito Repellent
Cetyl alcohol	5 gm	Stiffening Agent , Thickener
Stearic Acid	7 gm	Emulsifier and oil base
Beeswax	5gm	Stabilizing agent, Emollient
Liquid Paraffin	4 ml	LubricatingAgents, Emollients
B . Water Phase		
Glycerin	4 ml	
Propylene Glycol	4 ml	Humectant
Methyl Paraben	0.6 gm	Humectant , Plasticizer
Water	Q.S	Vehicle
C.Organoleptic Ingredients		
Coconut Oil	Q.S	Antioxidant
Aloe Gel	5 gm	Moisturizing Agent
Colours (BEET Juice)	Q.S	Coloring Agents
Perfumes (Rose Essence)	Q.S	Fragrances

Formulation Table For 50gm Cream

Preparation Of Herbal Mosquito Repellent Cream :-

- **Preparation Of Oil Phase:**
  1. Solid is melted and added to liquid solution at gentle heating on water bath.
  2. Add essential oils at (45 degree Celsius) just before mixing two phases.
- **Preparation Of Water Phase:**
  1. Aqueous ingredients such as glycerin and water soluble preservative should be dissolved in sufficient quantity of water (rose water).
  2. Add propylene glycol as the last part of aqueous phase.
- **Mixing Sequence:**
  1. 1.Prepare aqueous phase and oil phase into separate containers before mixing.
  2. 2.To make W/O emulsion , keep the amount of oil phase higher than or equal to aqueous phases .
  3. Add aqueous phase to oil phase through wall of the container to ensure little loss of two phases
  4. Stir emulsion at constant temperature (65 to 75 degree Celsius) for 45 – 60 min for proper emulsification.
  5. 5.After proper emulsification , add heat-sensitive ingredients (color , fragnances) at lower temperature (below 40 degree Celsius). (18)



Preparation of cold cream (Emulsion)

RESULT AND DISCUSSION :-

Sr. No.	Evaluation test	F1	F2	F3
1.	Spredability	6	6.5	6.5
2.	Washability	Good with water better with detergent	Good with Water better with Detergent	Good with Water Better with Detergent
3.	Ph Determination	5	5	5
4.	viscosity (BrookfieldViscometer)	At 10rpm using spindle s(64) Viscosity was Found to be 59990cp	At 10 rpm using Spindle s(64) Viscosity was found to be 55190cp	At 10 rpm using Spindle s(64) Viscocity was found to be 54990cp
5.	Ease of Application	Easy	Easy	Easy
6.	Irritability	Non -Irritant	Non –irritant	Non –Irritant

CONCLUSION AND OUTCOMES :-

❖We have studied the Prepared Formulation and evaluated all its Properties which has been found to be within limit .

❖Herbal Ingredients has open the way to formulate herbal formulations without harmful effects which imparts the required properties .

❖The Preparation is a herbal cream and free from side effects therefore herbal products are high in demand .

❖Expenses is less as compared to synthetic formulations .

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