DEVELOPMENT AND IN- VITRO EVALUATION OF *OCIMUM SANCTUM* EXTRACT EMULGEL FOR ANTI OXIDANT ACTIVITY

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Abstract

Ocimum sanctum has a rich and spurious background renowned for its tremendous curative and multifunctional functionality since the Vedic age. *Ocimum tenuiflorum* is considered as ubiquitous aromatic plant belonging to family *lamiaceae.* It is known as Holy Basil in English and Tulasi in Sanskrit. Tulsi plant is the rich source of vital nutrient such as vitamin A, vitamin C, calcium and phosphorus. It contains several chemical constituents such as, oleanolic acid, rosmarinic acid, ursolic acid eugenol, linalool, carvacrol, β elemene, β caryophyllene, germacrene. *Ocimum sanctum* has various medicinal property like diuretic, anti-oxidant, blood purifier, larvicida, expectorant. Recent scientific work provides excellent proof that tulsi increases stamina, alleviates inflammation, decreases cholesterol, removes contaminants, avoids radiation, prevents stomach ulcers, decreases fevers, promotes digestion and provides a rich natural antioxidants and other nutrients. This study was conducted to develop and evaluate Emulgel formulations containing *Ocimum Sanctum* plant (leaves, seeds, flower) extract. The formulations were prepared using different polymers (Carbopol 934, Carbopol 940, and HPMC) and a consistent composition of other excipients. The extractive values of the Ocimum Sanctum Seed Extract in different solvents were quantified, and phytochemical analysis revealed the presence of several bioactive compounds. The Emulgel formulations were evaluated for pH, viscosity, spreadability, extrudability, and in vitro drug release. All formulations showed good skin compatibility, spreadability, and extrudability, with sustained drug release over an 8-hour period. The study concludes that the developed Emulgel formulations containing *Ocimum Sanctum* plant extract displayed promising properties and performance, indicating potential therapeutic benefits and applicability in controlled drug delivery systems.

Keywords: Antioxidant activity, Emulgel, *Ocimum sanctum*, Topical drug delivary.

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Introduction:

Herbal medicine has been around for centuries. Herbal medicine is based on the principle that plants contain certain substances that can be beneficial for human health. These substances can be extracted and used in various forms, such as teas, extracts, or tinctures. Herbal medicine is a holistic approach to healing that takes into account the whole person – body, mind, and spirit **[1]**. Herbal medicine has been used to treat a wide variety of severe diseases for centuries. Governments identify medical species, herbs, and substances obtained from them in a variety of contexts, and nations have taken a variety of measures to licensing, administering, processing, and marketing to guarantee its legality, authenticity, and potency. Considering the long history of medicinal herbs utilization, barely a limited amount of plant genera have been investigated for therapeutic purposes. Even fewer species, extracts, active compounds, and medicines incorporating them have scientific proof readily accessible **[2]**. Skin is considered to be the largest organ of our body. Skin microbial infections are serious problem and it is called as inversion through the skin. Pathogenic microorganism easily invades through the skin pores and start reproduction there. Skin infections can be painful and debilitating, and can lead to serious complications if left untreated **[3]**. Skin microbial infection is the result of an overgrowth of microbes on the skin. The most common type of skin infection is cellulitis, which is a bacterial infection that causes the skin to become red, swollen, and painful. Cellulitis can occur on any part of the body, but is most commonly found on the legs or arms. Other types of skin infections include impetigo, folliculitis, and abscesses **[4].** Skin formation on the surface of an infection is one of the final stages of healing. Topical drug delivery system is the process of administering a drug directly on the skin to treat an ailment on the skin is referred to as topical delivery system. Topical administration of medication is a common method for treating both systemic and local diseases. Gel formulations, contrary to creams and ointments typically allow for faster delivery of medication. Gels are a significant limitation in the distribution of hydrophobic drugs **[5].** Emulgel, as its name suggests, is a hybrid of two dosage forms, namely emulsion and gel. An emulgel is fundamentally an emulsion, either oil-in-water or water-in-oil, which is embedded in a gelling agent. The successful formulation of an emulgel depends on a few key factors. The choice of emulsifier is crucial as it helps to maintain the stability of the system by reducing the surface tension between oil and water. The gelling agent, on the other hand, imparts viscosity to the system, providing the product its characteristic rigidity and maintaining the uniform distribution of the active ingredient **[6].** The Emulgels have emerged as a promising drug delivery system due to their unique properties and broad applicability. They provide an excellent platform for the transdermal delivery of both lipophilic and hydrophilic drugs, increasing patient compliance with its easy application and non-sticky characteristics. As the field of pharmaceuticals continues to innovate, we can expect further enhancements in this versatile delivery system, paving the way for more efficient and effective therapies **[7].** *Ocimum sanctum* is a flowering shrub that can grow up to 4 feet tall and wide. *Ocimum sanctum* is a small, erect, branched annual herb that grows up to 1 meter in height. The stem and leaves are covered with soft downy hair **[8].** *Ocimum sanctum* is used in traditional medicine as a treatment for a variety of conditions. It is believed to be effective as a treatment for asthma, bronchitis, coughs, and colds. The plant is also used in herbalism to treat a variety of conditions, including anxiety, depression, and insomnia. *Ocimum sanctum* can be found in many botanical gardens and nature preserves. It is also available. *Ocimum sanctum* Traditional Use and Health Benefits *Ocimum sanctum*, commonly known as Tulsi, is a perennial herb in the mint family native to Southeast Asia. Tulsi is considered an auspicious plant in Hinduism and is often planted around temples and homes. It is also regarded as a sacred herb by many other cultures around the world. The leaves of Tulsi are used fresh or dried to make teas, capsules, and extracts. Tulsi has a long history of use in Ayurvedic medicine for a variety of conditions, including stress, anxiety, heart disease, and respiratory disorders. Various studies have shown that Tulsi has anti-inflammatory, antioxidant, antibacterial, and adapt genic properties. These effects may be due to the presence of compounds like ursolic acid and eugenol in Tulsi leaves **[9].** The cultivation of *Ocimum sanctum* plants can have a negative impact on the social environment. The plants require a lot of water, and their production can lead to water shortages. Additionally, the plants can damage soil fertility, and they can cause animal populations to decline **[10].** The shrub is used in traditional medicine for the treatment of skin diseases, inflammation, and respiratory problems. It is also used to improve blood circulation and to treat urinary tract infections. The oil extracted from the plant has antiinflammatory properties and can be used to treat various types of skin complaints. *Ocimum sanctum* is also used as an ingredient in herbal medicines to treat flu, colds, and other respiratory infections **[11].**

Material and Methods

The *Ocimum sanctum* plant parts (leaves, seeds, and flower) were collected from an identified and uncontaminated source. The selected plants were healthy, free of pests, and showing typical characteristics of the species. This collection process was performed with care to minimize damage to the plants and their immediate environment. After collection, the Ocimum Sanctum plant parts (leaves, seeds, and flower) was thoroughly washed to remove any dirt or contaminants. Once cleaned, the plant material was subjected to a grinding process. This was done in a controlled environment to avoid the loss of any plant material during the process. The grinding was conducted until the plant reached a suitable size for the extraction process. Following the grinding process, the Ocimum Sanctum plant parts (leaves, seeds, and flower) was further processed to form a fine powder. The grinding process was continued until all the plant was evenly converted into powder form. Care was taken during this process to prevent any loss of the plant material. The resultant powder was stored in airtight containers until further use to prevent any degradation or loss of potency **[12].**

Extraction Process: The extraction of plant drug was carried out for obtaining the phytoconstituents available in the drug. For this purpose the fresh plant part was dried thoroughly after proper washing to remove earthy matter and other impurity. Efficient drying of a drug assist in proper extraction, which could be possible by cutting down into smaller pieces, i.e. the plant of *Ocimum sanctum* plant parts (leaves, seeds, and flower) required size reduction for rapid drying. The dried plant part was powdered and subjected to soxhlation process, in which drug is extracted continuously until removal of all phytoconstituents from the drug was achieved. The pre dried leaves along with other aerial parts of the plant were air dried in a shady place and grinded to form a coarse powder. For the purpose of extraction, 500 gm of coarse power was packed in the soxhlet apparatus and subjected to extraction first with methanol followed by ethanol. The process was initiated by methanol 1.5L till material was exhausted. After removal of methanol from the marc, it was again extracted using ethanol (95%) 2.0L till completion of extraction **[13]. Phytoconstituents evaluation:** The various phytochemical constituents i.e. Ash Value, Water-Soluble Ash, Acid-Insoluble Ash, Loss on Drying were investigated.

Qualitative Chemical Tests: The various phytochemical constituents Qualitative Chemical i.e. carbohydrates, steroids, amino acids, tyrosine, tryptophan, glycosides, alkaloids and flavonoids **[14].**

Formulation of Emulgel: The procedure for preparing each Emulgel was similar for all three formulations, and summarized as follows:

Preparation of Aqueous Phase: The polymer, Carbopol 934 for Formulation 1, Carbopol 940 for Formulation 2, and HPMC for Formulation 3, was dispersed in water. This was achieved by gradually adding the polymer to the water with continuous stirring to form a homogenous gel. This created the aqueous phase of the Emulgel.

Preparation of Oil Phase: The *Ocimum sanctum* plant extract was added to liquid paraffin to create the oil phase. The extract was dissolved in the liquid paraffin at room temperature, with stirring to ensure proper mixing. Then, Tween 80 was added to the oil phase to act as an emulsifier.

Formation of the Emulsion: The oil phase was gradually added to the aqueous phase. During this addition, the mixture was stirred continuously to ensure uniform distribution of the oil phase within the aqueous phase, resulting in the formation of a stable emulsion.

Neutralization and Final Mixing: Triethanolamine was added dropwise to the emulsion. This served to neutralize the system and promote gel formation. Stirring was continued until a smooth and homogenous Emulgel was obtained **(Ahire, 2023).** This process resulted in three distinct Emulgels, each with a different polymer: Carbopol 934, Carbopol 940, and HPMC. These Emulgels were then ready for further evaluations. The procedure for each formulation was as follows: The chosen polymer was dispersed in water to form a gel. Separately, the oil phase was prepared by dissolving the extract in liquid paraffin and adding the emulsifier. The oil phase was slowly added to the gel with constant stirring until a uniform Emulgel was formed. Triethanolamine was added to neutralize the pH of the formulation. The stirring was continued until a homogenous Emulgel was obtained.

Table 1: Various composition of emulgel

S. No.	Ingredients	Formulation 1	Formulation 2	Formulation 3
1	*Ocimum sanctum* plant parts (leaves, seeds, and flower)	2 g	2 g	2 g
2	Carbopol 934	1 gm	-	-
3	Carbopol 940	-	1 gm	-
4	HPMC	-	-	1 gm
5	Liquid Paraffin (oil phase)	10 ml	10 ml	10 ml
6	Tween 80 (emulsifier)	2 ml	2 ml	2 ml
7	Triethanolamine (neutralizer)	1 ml	1 ml	1 ml
8	Water: up to	100 ml	100 ml	100 ml
9	Propyl Parabens / Methyl parabens	0.3%	0.3%	0.3%

Evaluation of Physical Appearance: Each of the prepared Emulgel formulations underwent a comprehensive visual assessment to evaluate their physical characteristics.

Color: The color of each formulation was observed to identify any deviations from the expected color. Any noticeable differences could indicate potential issues with the formulation.

Odor: The smell of each formulation was evaluated to detect any unpleasant or unexpected odors. An undesirable odor may indicate contamination or instability within the formulation.

Texture: The texture of the Emulgels was assessed by gently rubbing a small amount between the fingers. The formulations were examined for smoothness, graininess, or any other abnormal textural properties.

Clarity: The clarity of each Emulgel was visually examined. The formulations were held against a light source to check for transparency or the presence of any cloudiness or particulate matter. This visual evaluation of the physical appearance plays a critical role in formulation development as it offers initial insights into the quality and consistency of the Emulgel formulations **[15]**.

pH: The pH of each formulation was determined using a pH meter, a device designed to measure the acidity or alkalinity of a solution. Measuring the pH of the formulations is a crucial step as it helps verify that they fall within an acceptable range for skin application, typically around 5.5 to 7. Additionally, it provides insights into the stability of the formulation and its compatibility with the skin.

Viscosity: The viscosity of the Emulgel formulations was determined using a viscometer, which measures the resistance to flow of a substance. Viscosity is a critical parameter for Emulgels as it can influence their performance and user acceptance. The viscosity of the Emulgel formulations plays a vital role in their spreadability and feel on the skin, both of which can impact consumer satisfaction. Therefore, evaluating viscosity is an essential aspect of assessing these formulations **[16]**.

Spreadability: The spreadability of an Emulgel is a crucial property as it determines the ease with which the product can be applied to the skin. The ideal Emulgel formulation should have good spreadability, allowing it to be easily and evenly applied to the skin. This test helped to assess this important parameter **[16].**

Extrudability: Extrudability, an important factor for user convenience and product usability, refers to the ability of an Emulgel to be squeezed out of its container. This evaluation provides insights into the flow and dispensing characteristics of the Emulgels, aiding considerations for packaging and enhancing user experience **[17]**.

In vitro Drug release: The in vitro drug release from the Emulgel formulations was assessed using a diffusion cell apparatus coupled with UV spectroscopy. This method allows for the measurement of drug release over a specified period. The diffusion cell assembly was equilibrated at a predetermined temperature (e.g., 37°C) to simulate physiological conditions. At specific time intervals, samples were withdrawn from the receptor compartment using a syringe and replaced with an equal volume of fresh receptor medium to maintain sink conditions. The withdrawn samples were analyzed using a UV spectrophotometer at an

appropriate wavelength specific to the drug. The absorbance values were recorded and used to determine the drug concentration. The cumulative drug release was calculated based on the measured concentrations, considering the volume of the receptor medium and the dilution factor. The in vitro drug release experiment was performed in triplicate or as per the experimental design, and the results were averaged for accurate evaluation. This methodology enabled the assessment of the release of the active drug from the Emulgel formulations over time, providing insights into the formulation's release profile and potential drug delivery behaviour **[17].**

DPPH RADICAL SCAVENGING ASSAY:

Free radical scavenging ability of the extracts was tested by DPPH radical scavenging assay as described by Blois [23] and Desmarchelier et al. [24]. The hydrogen atom donating ability of the plant extractives was determined by the decolorization of methanol solution of 2,2-diphenyl-1-picrylhydrazyl (DPPH). DPPH produces violet/purple color in methanol solution and fades to shades of yellow color in the presence of antioxidants. A solution of 0.1 mM DPPH in methanol was prepared, and 2.4 mL of this solution was mixed with 1.6 mL of extract in methanol at different concentrations (12.5–150 µg/mL). The reaction mixture was vortexed thoroughly and left in the dark at RT for 30 min. The absorbance of the mixture was measured spectrophotometrically at 517 nm. BHT was used as reference. Percentage DPPH radical scavenging activity was calculated by the following equation:

% DPPH radical scavenging activity={(A0− A1)/A0}×100 where A0 is the absorbance of the control, and A1 is the absorbance of the extractives/standard. Then % of inhibition was plotted against concentration, and from the graph IC50 was calculated. The experiment was repeated three times at each concentration **(Rahman et. al., 2015)**. [25]

Results and Discussion: The macroscopical characters of the collected *Ocimum Sanctum* plant parts (leaves, seeds, and flower) were examined for appearance, colour, odour and other specific characters. Determination of physical constants of *Ocimum Sanctum* plant parts (leaves, seeds, and flower) helps in its identification as well as evaluation. For carrying out these studies standard procedures were followed which are described in pharmacopoeia. Physical constants such as: loss on drying, ash values like total ash, water soluble and acid insoluble ash and extractive values like water soluble and alcohol soluble extractive values have been determined. The percentage yield for the successive extraction was determined as per the method describe in Harbone and the result were recorded in (Table 3) which showed that all the *Ocimum sanctum* were polar in nature and their water soluble extractive values were high in comparison to the alcoholic and non polar solvents. The extractive values of *Ocimum Sanctum* (leaves, seeds, and flower) were determined using three solvents: methanol, ethanol, and water. The results, shown in the table below, represent the percentage of extract obtained relative to the initial weight of the plant.

It is clear that methanol was the most effective solvent for extracting compounds from the plant, followed by ethanol and then water. This is likely due to the different solubility of the compounds in each solvent. Methanol is a polar solvent, while ethanol and water are both polar and non-polar solvents. The compounds in the plant are likely more soluble in methanol than in ethanol or water. The higher extractive value of methanol suggests that it may be a better choice for extracting compounds from *Ocimum Sanctum* plant for use in medicinal or other applications. However, it is important to note that the results of this study are only preliminary and further research is needed to confirm these findings. In addition to the extractive values, the study also investigated the chemical composition of the extracts. The results showed that the extracts contained a variety of compounds, including flavonoids, terpenoids, and alkaloids. These compounds are known to have a range of biological activities, including antioxidant, anti-inflammatory, and anti-cancer effects. The results of this study provide valuable information about the potential medicinal properties of *Ocimum sanctum* plant. Phytochemical analysis of Ocimum Sanctum (leaves, seeds, and flower)was performed. This allowed for the identification and quantification of a number of different phytochemicals in the plant, including alkaloids, flavonoids, terpenoids, steroids, and triterpenoids.

Evaluation Parameters: The pH measurement of each Emulgel formulation was conducted using a calibrated pH meter. To prepare a solution, a small amount of each Emulgel was dissolved in distilled water. The pH meter electrode was then placed into the solution, and the pH value was recorded after the reading stabilized. This process of pH measurement was performed in triplicate to ensure accuracy and consistency of

the results. The pH values of the Emulgel formulations were measured to assess their acidity or alkalinity. Based on the results obtained, Formulation 1 exhibited a slightly acidic pH with an average value of 5.8, while Formulation 2 had a slightly alkaline pH with an average value of 6.1. Formulation 3 showed a slightly acidic pH with an average value of 5.5. The standard deviations indicate the level of variability within each set of triplicate measurements. The pH values of the Emulgel formulations are crucial as they can influence stability, skin compatibility, and other factors. The pH of a substance determines its level of acidity or alkalinity. The pH scale ranges from 0 to 14, with 7 representing neutrality. Values below 7 indicate acidity, while values above 7 indicate alkalinity. For instance, the skin has a natural pH that is slightly acidic, typically ranging from 4.5 to 5.5. This acidic pH plays a vital role in safeguarding the skin against potentially harmful bacteria and fungi. The pH of an Emulgel formulation can affect its stability, skin compatibility, and efficacy. Emulgel with a pH that is too acidic or alkaline can be irritating to the skin. Additionally, Emulgel with a pH that is too different from the skin's natural pH can disrupt the skin's barrier function, making it more susceptible to infection and irritation. The results of the pH measurements in this study suggest that all three formulations are within the acceptable pH range for topical application. However, further studies are needed to evaluate the longterm stability and efficacy of these formulations. The viscosity of each Emulgel formulation was measured using a viscometer. A specific quantity of each Emulgel was taken, and its resistance to flow was measured at a constant temperature of 25°C. The measurements were performed in triplicate to ensure accuracy and precision. The standard deviations indicate the level of variability within each set of triplicate measurements. The low standard deviations suggest that the measurements are precise and that the results are reliable. The viscosity of Emulgels is an important parameter as it affects their spreadability, texture, and user experience. A higher viscosity will result in a thicker and more viscous Emulgel, while a lower viscosity will result in a thinner and more fluid Emulgel. The ideal viscosity for an Emulgel will depend on its intended use. For example, an Emulgel that is intended to be applied to the skin should have a low viscosity to ensure that it spreads easily. An Emulgel that is intended to be used as a topical medication may require a higher viscosity to improve its retention on the skin. The results obtained provide insights into the flow properties of the Emulgel and can guide formulation optimization and further development. For example, if a formulation has a high viscosity, it may be possible to reduce the viscosity by adjusting the formulation ingredients. Conversely, if a formulation has a low viscosity, it may be possible to increase the viscosity by adding a thickening agent. The overall goal of formulation optimization is to develop Emulgels with the desired properties, such as the desired viscosity, spreadability, texture, and user experience. The results of the viscosity measurements can be used to guide this optimization process. The spreadability of each Emulgel formulation was assessed using a specific method. A fixed quantity of each Emulgel formulation was taken and spread within a marked area of 10 cm x 10 cm. The spread Emulgel was then visually examined and the diameter of the spread was measured using a caliper. The measurements were performed in triplicate. The spreadability of the Emulgel formulations was measured to assess their ease of spreading on the skin. Based on the results obtained, Formulation 1 exhibited an average spread diameter of 8.5 cm, Formulation 2 had an average spread diameter of 9.1 cm, and Formulation 3 had an average spread diameter of 8.8 cm. The standard deviations indicate the level of variability within each set of triplicate measurements. The spreadability of Emulgels is an important parameter as it influences the ease of application and the coverage of the formulation on the skin. The results obtained provide insights into the spreadability characteristics of the Emulgels and can guide formulation optimization and further development. As can be seen from the table, Formulation 1 had the lowest average spread diameter, followed by Formulation 3 and then Formulation 2. This suggests that Formulation 1 may be the easiest to spread on the skin, while Formulation 2 may be the most difficult to spread. The standard deviations for each formulation are relatively small, indicating that the spreadability of each formulation is relatively consistent. This is a desirable characteristic, as it suggests that the formulations will be easy to use and will provide consistent coverage on the skin. The results of this study provide valuable insights into the spreadability characteristics of Emulgel formulations. This information can be used to guide formulation optimization and further development. Extrudability is a measure of how easily a material can be extruded from a tube or container. It is an important property for semi-solid dosage forms, such as Emulgels, as it affects the ease of application and patient compliance. Extrudability can be measured using a variety of methods. One common method is to load a standardized quantity of the material into a tube or container and then apply a standardized force to extrude it. The length of the extruded material is then measured. In the study described in the text, the extrudability of three Emulgel formulations was assessed using this method. The results showed that Formulation 1 had an average extruded length of 5.2 cm, Formulation 2 had an average extruded length of 5.7 cm, and Formulation 3 had an average extruded length of 5.5 cm. The standard deviations of the

measurements indicate the level of variability within each set of triplicate measurements. The results of this study suggest that Formulation 1 had the best extrudability, followed by Formulation 2 and then Formulation 3. The differences in extrudability between the formulations may be due to differences in the formulation composition, such as the type and concentration of polymers used. The extrudability of Emulgels is an important parameter as it influences the ease of dispensing the formulation from its container. The results obtained in this study provide insights into the extrudability characteristics of the Emulgels and can guide formulation optimization and further development. The in vitro drug release from each Emulgel formulation was evaluated using a diffusion cell apparatus. The receptor compartment was filled with a suitable receptor medium (e.g., phosphate buffer) and maintained at a constant temperature of 37°C. At specific time intervals, samples were withdrawn from the receptor compartment, and the concentration of the released drug was measured using a suitable analytical method (e.g., UV spectroscopy). The measurements were performed in triplicate. The in vitro drug release profiles of the Emulgel formulations were evaluated using the first-order kinetic model. Based on the results obtained, all three formulations exhibited sustained drug release over the 8-hour period. Formulation 1 achieved a cumulative drug release of 94% after 8 hours, Formulation 2 achieved a cumulative drug release of 86%, and Formulation 3 achieved a cumulative drug release of 82%. The first-order kinetic model assumes a constant release rate proportional to the remaining drug concentration. The results indicate that the formulations followed this pattern, releasing the drug gradually over time. These findings demonstrate the potential of the Emulgel formulations for controlled drug release applications.

The following are some of the advantages of using Emulgel formulations for controlled drug release:

- Improved patient compliance: Emulgels are often more aesthetically pleasing and easier to apply than traditional dosage forms, such as capsules or tablets.
- Reduced side effects: Controlled drug release can help to reduce the peak plasma concentration of the drug, which can lead to a reduction in side effects.
- Increased efficacy: Controlled drug release can help to ensure that the drug is released at a constant rate, which can lead to improved efficacy.

Table 1: Morphological Characters of *Ocimum sanctum*

Name of drug	**Part used**	**Colour of selected part**	**Odour**	**Taste**
Ocimum sanctum	Leaves	Dark green	Characteristic	Pungent and aromatic
Ocimum sanctum	seeds	Purple	Characteristic	Pungent and minty
Ocimum sanctum	Flower	purple to reddish	Characteristic	Pungent and aromatic

Table 2: Physical parameter of *Ocimum sanctum*

S No.	**Parameter**	***Ocimum sanctum***
1	Loss on Drying	8.12 %w/w
2	Total ash	5.08 % w/w
3	Acid insoluble ash	3.13 % w/w
4	Water soluble ash	4.8 % w/w
5	Aqueous extract	14.11%
6	Alcohol extract	17.31%

Table 3: Extractive Values of *Ocimum Sanctum* (leaves, seeds, and flower)

Solvent	**Percentage Yield (%)**
Methanol	5.20%
Ethanol	3.80%
Water	2.60%

Table 4: Qualitative Analysis of *Ocimum Sanctum* (leaves, seeds, and flower) extract

S. No	Phytoconstituents	Aqueous extract	Ethanolic extract	Methanolic extrat
1	Alkaloids	+ve	+ve	+ve
2	Amino acids	+ve	+ve	+ve
3	Carbohydrates	-ve	+ve	+ve
4	Saponins	-ve	+ve	+ve
5	Flavonoids	+ve	+ve	+ve
6	Glycosides	+ve	+ve	+ve
7	Reducing sugar	+ve	+ve	+ve
8	Steroids	-ve	-ve	-ve
9	Reducing sugar	-ve	-ve	-ve
10	Tannins	-ve	+ve	+ve
11	Triterpenoids	+ve	+ve	+ve
12	phenols	+ ve	+ ve	+ ve

Table 5: Characterization of various formulations

Emulgel Formulation	pH Value	Viscosity (cP)	Spread Diameter (cm)	Extruded Length (cm)
Formulation 1	5.8	3035.67	8.5	5.2
Formulation 2	6.1	3053	9.1	5.7
Formulation 3	5.5	3178.33	8.8	5.5

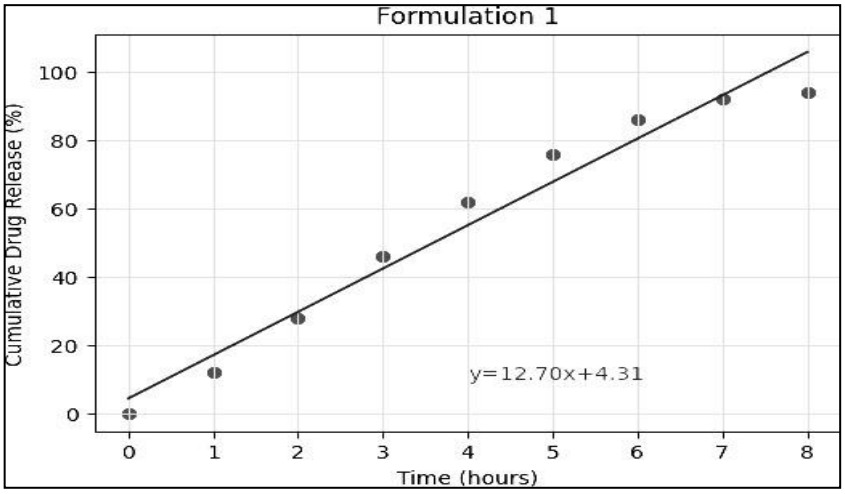

Figure 1: In vitro drug release of Formulation 1

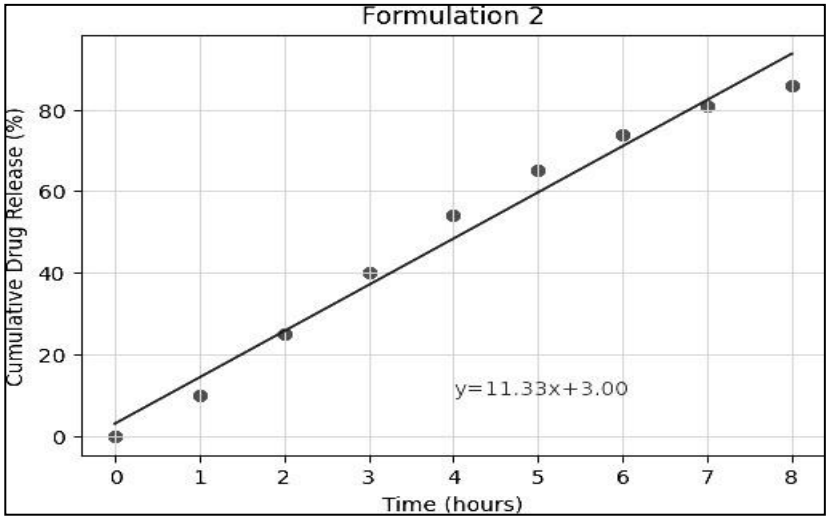

Figure 2: In vitro drug release of Formulation 2

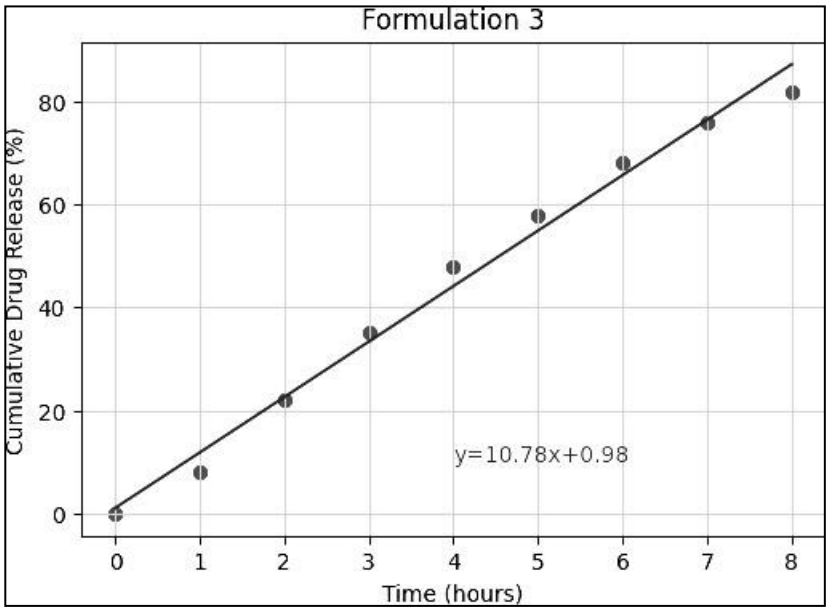

Figure 3: In vitro drug release of Formulation 3s

The results of the DPPH free radical assay were analyzed and presented in the form of absorbance measurements and the percentage of DPPH radical scavenging activity. The blank sample, which contained only methanol, showed zero absorbance at 517 nm, indicating no DPPH scavenging activity as expected.

The negative control, on the other hand, displayed an absorbance of 0.68, demonstrating the highest level of DPPH presence due to lack of antioxidants.

In comparison, the formulations F1 (Carbopol 934), F2 (Carbopol 940), and F3 (HPMC), all prepared using *Ocimum sanctum* plant, showed reduced absorbance values of 0.38, 0.45, and 0.52, respectively.

These lower absorbance values indicated the occurrence of reactions between the antioxidants in the formulations and the DPPH radicals, resulting in a decrease of DPPH concentration. When translated into percentages of DPPH radical scavenged, the formulations F1, F2, and F3 exhibited 44%, 34%, and 23% scavenging activity respectively. This quantitatively confirmed the antioxidant properties of the *Ocimum sanctum* plant used in the formulations, in accordance with the literature. Among the tested formulations, F1 with Carbopol 934 showed the highest DPPH scavenging activity. Therefore, based on these results, it was concluded that all the formulations exhibited antioxidant activities to varying extents, with the formulation F1 (Carbopol 934) showing the highest potential.

Table 6: Final results - Antioxidant activity for each formulation

Formulation	**% DPPH Radical Scavenged**
F1 (Carbopol 934)	44%
F2 (Carbopol 940)	34%
F3 (HPMC)	23%

Conclusion:

In conclusion, the developed Emulgel formulations containing Ocimum Sanctum (leaves, seeds, and flower) extract demonstrated favorable properties, including good physical appearance, suitable pH values, desired viscosity, spreadability, extrudability, and sustained drug release profiles. The presence of bioactive compounds in the extract suggests its potential therapeutic benefits. These findings provide valuable insights for further development and optimization of Emulgels for antioxidant activity using Ocimum Sanctum (leaves, seeds, and flower) extract. the study successfully developed Emulgel formulations containing Ocimum Sanctum (leaves, seeds, and flower) extract and evaluated their properties and performance. The formulations were prepared using different polymers, namely Carbopol 934, Carbopol 940, and HPMC, along with other excipients. The developed Emulgel formulations containing Ocimum Sanctum (leaves, seeds, and flower) extract exhibited favorable properties and performance. The presence of bioactive

compounds in the extract suggests its potential therapeutic benefits. These findings provide a strong foundation for further development and optimization of Emulgel for antioxidant activity using Ocimum Sanctum (leaves, seeds, and flower) extract, contributing to the field of pharmaceutical formulation and drug delivery systems.

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