FORMULATION AND EVALUATION OF NANO CREAM USING THE SILVER NANOPARTICLES EXTRACT OF BROWN SEAWEED

Aishwarya M, III Bsc., Department of Microbiology, Hindusthan college of arts & science, Nava India, Coimbatore - 641 028.

Dr.R.Manju, Associate professor, Department of microbiology, Hindusthan college of arts and science, Nava India, Coimbatore - 641 028.

ABSTRACT

The present study develops a formulation of Nano cream which is made by the extract of marine seaweed (Brown algae) from the Kodiyakkarai beach in Nagapattinam district . The antioxidant activity of the cream formulation from the silver rnanoparticles extract of brown algae were found. The biosynthesis of AgNP's were characterized by uv - visible spectroscopy. After confirming the antimicrobial property of AgNP's they were incorporated into the cream. Cream formulation of AgNP's were prepared and confirmed for their antimicrobial activity against human pathogens. Our results show that AgNP cream possess significantly higher antimicrobial activity against the tested organism and safe to use.

KEYWORDS: Nano Cream; Formulation; Brown algae; antimicrobial activity; Kodiyakkarai.

INTRODUCTION

Nanotechnology is a relatively young discipline.Today nanotechnology is not only essential for marketing-oriented chemical companies, but also a tool for developing science-based solutions for innovative therapeutics and cosmetics, enhancing well-being and addressing anti-aging issues. (Morganti.P, 2011). Nanoparticles have several applications in numerous fields like medical imaging, nanocomposites, filters, drug delivery, and physiological state of tumors (Lee *et al*., 2008; Tan *et al*., 2006). Silver nanoparticles are nanoparticles of silver having size range from 1 and 100 nm in size having unique properties such as electrical , optical, and magnetic having wide range of applicablity (Klaus T.J.R *et al*., 1999). Green chemistry is and encouraging approach mainly utilize nanosilver along with natural

biomolecules such as polysaccharides, tollens which overcomes drawbacks of conventional methods and produce AgNP's which are ecofriendly, nontoxic and coast effective (Senapathi.S, 2005). Metallic silver ions are inactive but once it come contact with reducing agent ionization occurs and it gets converted in its active form. Ionic silver is active form of silver which binds to cell wall of bacteria leading to major structural changes in cell morphology. AgNP's causes denaturation of RNA and DNA replication which further leads to cell death (Rai .M *et al*., 2009). Recently, silver nanoparticles have been investigated extensively due to their superiority stems mainly from the size, shape, composition, crystallinity,and structure of AgNP's compared to their bulk forms (Syafiuddin .A *et al*., 2017). With different surface properties, AgNP's can also be formed into various shapes, including rod, triangle, round, octahedral, polyhedral, etc(Heiligtag F.J *et al.*, 2013). AgNP's are used in antimicrobial applications with proven antimicrobial characeristics of Ag+ ions. These exceptional properties of AgNP's have enabled their use of nanomedicine, pharmacy, biosensing, and biomedical engineering. Marine environment presents great biodiversity with only a few species totally described. In fact, it has been studied as a unique source of microorganisms, animals, and plants with particular characteristics. Algae covers a range of organisms from different phylogenetic groups with approximately thirty thousand species described. In general, these can be categorized as multicellular macroalgae and unicellular microalgae (microscopic algae). However, it is necessary to consider that algae are evolutionarily heterogeneous (Wang *et al.*, 2015). Algae cells transform solar energy into chemical energy through photosynthesis process. Chemical energy is stored in the form of chemical compounds with particular biological activities named "bioactive compounds". From the perspective of Nature, the excretion of such chemicals could be related to the regulation of bacterial and algal populations (Nohynek *et al., 2010).* Several species of seaweeds have also been found to produce or contain polysaccharides, glycoproteins or other secondary metabolites with antimicrobial (Cox *et al.*, 2010; Gupta, Rajauria, & Abu-Ghannam, 2010a), antitumoral (Koyanagi *et al.*, 2003, Zubia *et al.*, 2009) or anti-viral activity (Artan *et al.*, 2008, Hemmingson *et al*., 2006, Zhu *et al*., 2004, Zhu *et al*., 2003). Among all the three types highest phytochemical content have been reported from brown seaweeds (Seafoodplus, 2008).

Brown seaweeds are considered to be a rich source of antioxidants (Cahyana *et al.*, 1992). Recently, the potential antioxidant compounds were identified as some pigments (fucoxanthin, astaxanthin, carotenoid e.g.) and polyphenols (phenolic acid, flavonoid, tannins e.g.). Those compounds are widely distributed in plants or seaweeds and are known to exhibit higher antioxidative activities. The activities have been reported through various methods of reactive oxygen species scavenging activity and the inhibition of lipid peroxidation (Yan *et al.*, 1999, Athukorala *et al.*, 2003a, Athukorala *et al.*, 2003b, Heo *et al.*, 2003a, Heo *et al.*, 2003b, Siriwardhana *et al.*, 2003, Siriwardhana *et al*., 2004). Skin is one of the most complex and largest organs, serving as a protective barrier against internal and external stress. Skin aging is one of the factors which bring concern to humans, as they do not want to lose their youthful apperance. Skin aging can be catergorized into intrinsic and extrinsic aging, where extrinsic aging is mostly caused by ultraviolet (UV) radiation. Chronic exposure to ultraviolet (UV) radiation will cause damage to the intracellular biomolecules (proteins, lipids, polysaccharides and nucleic acids) and result in skin inflammation, photoaging, hyperpigmentation and skin cancer (Hussein, M.R, 2005.,Talero, E, 2015.,Berthon, J.Y., 2017). Skin moisturizer is a formulation that is made up of a complex mixture of harmless natural ingredients that hydrates the skin and layers. Acne aggravation, eczema, physical texture as well as smoothness of skin arise if the skin is not properly moisturized (Meha Qassem *et al* ,2019). Moisturizing and hydration are crucial for skincare and are essential to maintain its healthy appearance and elasticity, while also strengthening its role as a barrier to harmful factors(Bedoux G *et al*.,2014). Thereby, moisturizers help in retaining the moisture content of the skin that improves skin dryness, bruising, and wrinkles. Some studies suggested that water along with certain acids such as hyaluronic helps in moisturizing the human skin (Bonté F, 2011). Acne is a skin condition that can affect you at any time of your life. As with pimples, acne is caused by clogged spores and the pimples are recurring and persistent. For acne prone skin, seaweed is effective as it contains natural anti-inflammatory and anti-bacterial properties. Moreover, the incorporation of silver nanoparticles into skincare formulations has demonstrated enhanced therapautic potential, owing to their unique physiochemical properties. The antimicrobial properties of silver nanoparticles caused the employment of those nanometals in numerous fields of medication, numerous industries, agriculture, packaging, accessories, cosmetics, health and military (Cho *et al*., 2005; Duran *et al*., 2007) .

Silver nanoparticles with their large surface to volume ratio have been widely studied as a valuable material for their strong antimicrobial effect (Song *et al.*, 2012) [64]. The toxicity of silver nanoparticles has been well-known to a wide range of microorganisms. The antibacterial property of silver nanoparticles against *Staphylococcus aureus, Pseudomonas aeruginosa* and *Escherichia coli* has been investigated (Birla *et al.*, 2009). It was considered that silver nanoparticles of 1-10 nm range attach to the surface of the cell membrane and distrub its proper function like permeability and respiration (Morones *et al.*, 2005). The biosynthesized silver nanoparticles displayed antimicrobial activity against a range of pathogenic microorganisms, such as *C. albicans, V. parahaemolyticus, S. enterica, B. anthracis, B. cereus, and E. coli* (Singh *et al.*, 2015). In this project the AgNP's are biosynthesized using brown seaweed extract and identified the compounds responsible for the formation of AgNP's. To demonstrate the potential pharmaceutical and industrial applications of the synthesized AgNP's. The characterization of the size of silver nanoparticles is performed using UV -Spectroscopy technique. Additionally, physiochemical parameters, including PH, Temperature, spreadablity and texture will be assessed to ensure optimal product performance. The antimicrobial and antifungal activity of the silver nanoparticles extract from brown seaweed will be evaluated against the common skin pathogens, while the antioxidants assays will be assessed using DPPH method. The antibacterial and antifungal activity of the nano cream is assessed against a microorganisms commonly associated with skin infections. The cream's ability to inhibit the growth of these microorganisms is evaluated through standard microbiological techniques, determining the zone of inhibition. The safety and skin evaluations are conducted to ensure the compatiblity of the nano cream evaluated through toxicity test, by haemolytic assay. It contributes to the development of advanced skincare products that harness the antimicrobial benefits of silver nanoparticles and the skin health enhancing effects of brown seaweed extract

MATERIALS AND METHODS

SEAWEED SAMPLING:

Seaweed were collected from Kodiyakkarai beach in Nagapattinam district. The collected seaweed were washed properly to remove debris and any other unwanted materials. The fresh extract was filtered using what'sman filter paper and made of 10ml .

Figure 1 : Kodiyakkarai beach

Figure 2: Brown seaweed

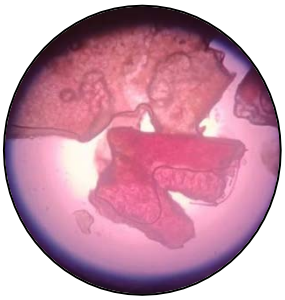


Figure 3: Microscopic view of Brown Macroalgae

Figure 4: Sampling of Brown seaweed

QUALITATIVE ANALYSIS OF PHYTOCHEMICAL SUBSTANCES IN BROWN SEAWEED

The various qualitative chemical tests can be performed to find a profile of a given extract for its bioactive compounds. The prepared extracts using brown seaweed were analyzed for the occurrence of alkaloids, saponins, tannins, steroids, flavonoids,

glycosides, proteins, amino acids and reducing sugars by using the protocols offered in the literature (Sofowora A, 1982).

Test for alkaloids: For Alkanoid identification, 1ml of concentrated Hydrochloric acid (HCL) was added to 1ml of extract.Then few drops of Mayer's reagent was added. Presence of green color or white precipitate indicates te presence of alkaloids.(Trease G E,1983)

Test for saponins: Mix about 1ml of the extract and add water and forcefully shaken in a test tube and then heated in a boiling water bath to get boil. The Effervescence was observed, which is considered as a preliminary support for the existence of the saponins (Kokate C K *et al*, 1997).

Test for tannins: Take 1ml of extract and added to a 5 ml of water kept in the test tube and filtered. Added a few drops of 0.1% ferric chloride and observed for brownish green or blue-black coloration. A brownish green color was formed which indicate the presence of tannins.

Test for steroids: To about 2ml of acetic anhydride was added to a 2 ml of extract along with 2ml of sulphuric acid. The change of color from violet to blue or green sample showed the presence of steroids. (Parthasarathy v *et al*., 2016).

Test for flavonoids: With 2 ml of extract was added to 1.5 ml of 50% methanol solution. The solution was warmed and added magnesium metal. In continuation added a few drops of conc.Hydrochloric acid and the red color were formed which showed the presence of flavonoids and the orange color indicated the presence of flavones (Hegde Karunkar et al, 2012).

Test for glycosides: About 2 ml of the extract was added to 1 ml of glacial acetic acid, which containing 1 drops of ferric chloride solution was dissolved. They were kept underlayered by adding 1ml of conc. sulphuric acid.At the interface a brown ring was formed indicated the presence of a deoxy sugar characteristic of glycosides.(Parthasarathy V *et al*., 2016).

Test for Proteins : To a 2ml of extract, 1ml of 40% NaOH solution was added and the added 2 drops of 1% CuSO4 solution. The presence of a peptide linkage of the

molecule was indicated by the violet color which shows the presence of protein.(Parthasarathy V *et al*.,2016).

Test for Amino Acids : To 2 ml of ethanolic extract, 2 ml of Ninhydrin reagent was added and laid in a water bath for about 20 minutes. The visual aspect of purple color formed indicated the presence of amino acids. (Parthasarathy V *et al*.,2016).

Test for Carbohydrates To a 2ml of extract , 2 drops of Molish's reagent were added and shaken well. About 2ml of conc. Sulphuric acid was added drop wise along the sides of the test tube. A reddish violet ring formed at the connection of two layers which indicated the presence of reducing sugar or carbohydrates (Siddiqui A A *et al*, 1997).

ANTIOXIDANT ACTIVITY:

The DPPH (2,2-diphenyl-1-picrylhydrazyl) method was used to evaluate the antioxidant activity of silver nanoparticle extract of seaweed. The stock solution of DPPH was prepared around 0.2mM concentration. The DPPH solution was mixed with series of test samples. The mixture was incubated under dark at room temperature for about 30-1 hour. The colour change from purple to yellow was observed as a result of DPPH reaction with the antioxidant present in the silver nanoparticle extract. The method confirms the ability to scavenge free radicals ,as evidenced by their DPPH radical scavenging activity (Sumaiyah *et al*.,2021)

PREPARATION OF SILVER NANOPARTICLE EXTRACT:

1mM Aqueous solution of silver nitrate were prepared by adding 0.169g of silver nitrate in 100ml of distilled water.The filtered 10ml seaweed extract were mixed with 90ml of silver nitrate solution and incubated in a closed metabolic shaker for 3 days After 3 days of incubation, the colour change was observed showing dark brown colour which conforms the synthesis of silver nanoparticles.The synthesised silver nanoparticles were seperated by centrifuging at 3000 rpm for 15min.The supernatant were collected and stored at refrigerated at 4°Cfor further use.(Gregory Marslin et.,2015)

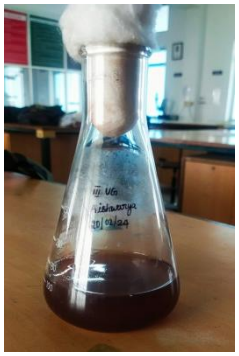


Figure 5 : AgNP synthezised from Brown seaweed

DETERMINATION OF SILVERNANOPARTICLE USING UV - VISIBLE SPECTROCOPY METHOD :

The UV-Vis spectrophotometer is set upped and its calibration is ensured.The synthesised silvernanoparticle is filled quartz to the cuvette and placed in the spectrophotometer sample holder. The silver nanoparticles were determined by UV - Vis spectrophotometer at a range of 250mn- 510nm. (S. Rajeshkumar *et al.*,2012)

TOXICITY TEST

HEMOLYTIC ASSAY

The hemolysis method is a technique used to determine the hemolytic activity of microorganisms.It is commonly performed in Blood agar plates.The method allow the identification of bacteria that can either completely lyse (beta - hemolysis),partially lyse (alpha - hemolysis), or do not lyse (gamma - hemolysis) red blood cells. 5% sheep blood agar plate was prepared. Using an inoculating loop, the silvernanoparticle extract synthesized by brown macroalgae were streaked on the blood agar plate. Incubated at 37c for 24 hrs.(Mogrovejo DC *et al*.,2020)

ANTIMICROBIAL ACTIVITY OF THE SILVERNANOPARTICLE EXTRACT FROM BROWN SEAWEED :

ANTIBACTERIAL ACTIVITY:

The antibacterial activity of silver nanoparticle extract of marine seaweed was evaluated against pathogenic bacteria such as *Salmonella typhi* by agar well diffusion method. The bioactive compounds present in seaweed extract shows the activity of zone of inhibition, suggests that it is an effective antibacterial agent.(S. Rajeshkumar *et al.*,2012)

ANTIFUNGAL ACTIVITY

The Silver nanoparticle extract have exhibited Antifungal activity against fungal species such as *Candida albicans*. These nanoparticles can suppress fungal growth including the pathogenic microrganisms.This activity suggests as effective antifungal agent.(S. Rajeshkumar *et al.*,2012)

FORMULATION OF CREAM

Creams are semi-solid emulsions of oil and water. They are topical preparations which could be medicated or non medicated. Medicated creams contain active pharmaceutical ingredients most often used as antimicrobial agent, anti-acne agent among others.They are often used because of their emollient and moisturizing properties.

Table 1: Ingredients and quantity in the cream formulation.

INGREDIENTS	**QUANTITY**
AgNP's Extract of Brown seaweed	2 ml
Emulsifying wax	9 gms
White soft paraffin	15 gms
Liquid Paraffin	6 gms
Chlororesol	0.1 gms

CREAM PREPARATION:

The creams were prepared according to Table 1 . Two (2) ml the AgNP's extract from brown seaweed was mixed with 0.1 g of chlorocresol. The required quantity of distilled water is added with the aid of heat to about 70 ℃.9 gram of emulsifying wax, 15 g of white soft paraffin and 6 g of liquid paraffin were melted together at 70 ℃. The chlorocresol and extract solution was added to it at same temperature (70 ℃) and stirred until it was cold. (Adeleye O A *et al.*,2019)

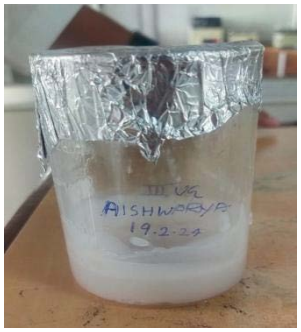


Figure 6: Cream Preparation

EVALUATION OF NANOCREAM

PHYSICAL EVALUATION:

The cream was applied on the hand and observed for the colour, odour and appearance.(Jumal llmiah *et al*.,2021)

WASHABILITY:

The cream was applied on the hand and observed under the running tap water.(Vaibhav A. Jadhav *et al*.,2013)

pH:

The pH meter was calibrated with the help of standard buffer solution. Weigh 0.5 gm of cream dissolved it in 50ml of distilled water and its PH wasmeasured with the help of digital pH meter (Vaibhav A. Jadhav *et al*.,2013)

IRRITATION TEST:

Mark an area (1sq.cm) on the left-hand dorsal surface. The cream was applied to the specified area and time was noted Irritancy, erythema, edema, was checked if any for regular intervals up to 24 hrs. and reported. .(Vaibhav A. Jadhav *et al*.,2013)

HOMOGENECITY:

Homogeneity was tested via the visual appearance and test. (Vaibhav A. Jadhav *et al*.,2013)

TEST FOR ANTIMICROBIAL ACTIVITY:

Agar media was prepared then the formulated cream was inoculated on the plate's agar media by agar well diffusion method .The plates were placed in the incubator and are incubated in 37℃ for 24 hours. After the incubation period, the plates were

taken out and the microbial growth were checked and compared with the control. (Gregor Marslin *et al*.,2015)

RESULTS

PHYTOCHEMICAL TEST

Table (1) : The Phytochemical constituents of the AgNP Extract of Brown seaweed.

SNO	PHYTOCONSTITUENTS	AgNP's EXTRACT OF BROWN SEAWEED
1	Alkanoids	+
2	Saponins	-
3	Tannins	+
4	Steroids	+
5	Flavonoids	+
6	Glycosides	+
7	Proteins	_
8	Amino acids	_
9	Carbohydrates	+

Positive (+) Negative (-)

Figure 6: Test for Alkanoids

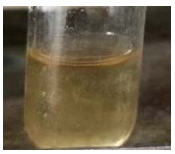


Figure 7: Test for Tannins

Figure 9: Test for flavanoids

Figure 8: Test for steroids

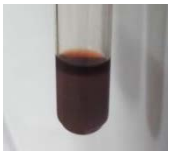


Figure 10: Test for Glycosides

Figure 11: Test for Carbohydrates

The preliminary phytochemical analyses make known that alkanoids ,tannins, sterioids, glycosides and carbohydrates are present in the AgNP's extract of Brown macroalgae as shown in the table 1. From the data it is clear that the brown seaweed may have a lot of potential chemical constituents. The obtained results can be as an initial step for further identification of bioactive compounds from the AgNP s extract of brown seaweed.

ANTIOXIDANT ASSAY:

DPPH RADICAL SCAVENGING ACTIVITY:

As DPPH is the commonly used method to evaluate the antioxidant activity of compounds. When an antioxidant compound is added to a DPPH solution, it can donate an electron or a hydrogen atom to the DPPH radical, neutralizing it and causing a color change.

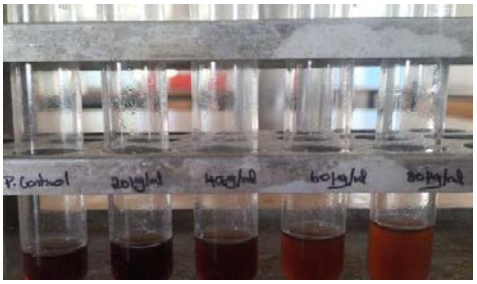
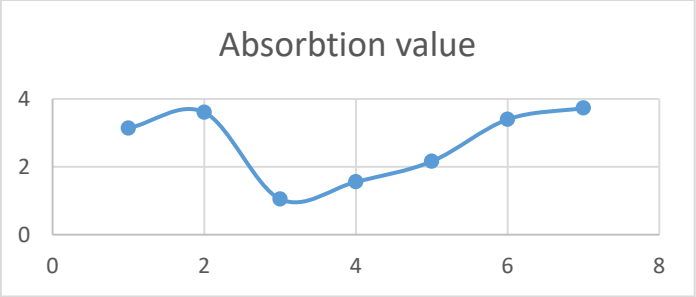


Figure 12: Antioxidant activity of the seaweed extract

Sample No	Abs
1	3.138
2	3.605
3	1.049
4	1.558
5	2.161

Table 2: The values obtained from UV - Vis Spectrosccopy



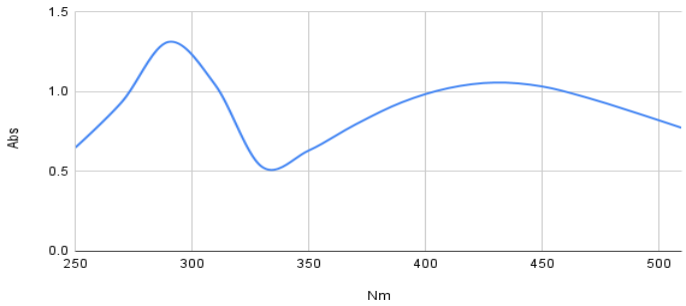
Graph 1 : DPPH Scavenging assay for the Brown seaweed sample

DETERMINATION OF SILVERNANOPARTICLE USING UV - VISIBLE SPECTROCOPY METHOD :

The colour change was observed in the silver nitrate solution incubated with the extract of Brown seaweed. Measuring the AgNp's extract with the broad spectrum between 270nm and 300 nm, confirms the presence of the silver nanoparticles present inthe solution.

Nanometer(nm)	**Absorbance value**
250	0.650
270	0.937
290	1.313
310	1.043
330	0.530
350	0.631
370	0.794
390	0.934
410	1.023
430	1.058
450	1.034
470	0.961
490	0.870
510	0.774

Table 3: UV -Vis Specctrocopy values for the AgNp extract from Brown seaweed.



Graph 2: The absorbance value for the AgNP's extract of Brown seaweed

TOXICITY TEST

HEMOLYSIS ASSAY:

After incubation the plate has no changes in the appearance of the blood around the streak Which shows no lysis in the plate confirms that there is no toxicity in the silver nanoparticle extract of the brown seaweed.

Figure 13: Hemolysis test

Figure 14: Control

ANTIMICROBIAL ACTIVITY FOR AgNP's EXTRACT OF BROWN SEAWEED:

AgNP's synthesised from brown seaweed act as an alternative source for microbial pathogens. The synthesized AgNP's were assessed for the antimicrobial activity against human pathogen. The AgNP's interact with bacteria and fungi and release the Ag+ions inside the cell and lactoprotein denaturation. The small size of AgNP's has a larger surface area, facilitates the interaction with bacterial and fungal cell wall membrane, including permeability and cell respiration, causing cell apoptosis (Panacek A,Kvited L *et al*.,2006)

ANTIBACTERI AL ACTIVITY:

It is well known that a number of chemical forms of silver exhibited antibacterial activities. AgNP's extract from brown seaweed showed a wider bacterial inhibition. It shows a zone of clearence around 7mm diameter in size against the bacteria *Salmonella typhi* which is the most acne causing bacterial agent

Figure 15: Antibacterial activity of AgNP's extract Brown seaweed.

ANTIFUNGAL ACTIVITY:

The AgNP's extract from brown seaweed exhibits antifungal activity against *Candida albicans* which is the most acne causing fungal species. The AgNP's extract synthezised from brown seaweed act as a good antifungal agent. Microbial growth of inhibition in AgNP's due to the surface and particle size variance .The possible mechanisms of antifungal activity is because of the generation of free radicals. The zone of inhibtion around 4mm diameter in size is shown in the incubated plate.

Figure 16: Antifungal activity of AgNP's extract from brown seaweed.

EVALUATION OF NANO CREAM:

The preparation can be declared as quality if it meets the criteria for physical properties and can maintain during storage. Physical properties tests were include physical evaluation, homogenecity, pH, washability , irritation test of the nano cream.

The physical properties tests were carried out by physical observations such as the odour, the colour, and the consistency of nano cream.The acceptance of use and aesthetic value of a product can be seen from physical properties test . The physical properties test was carried out by observing the preparation directly . The results of the physical properties test on AgNP's extract of brown seaweed nano cream showed that the nano cream had a characteristic of the extract . The nano cream formula gives a whitish-brown precipiation and it gives a thick consistency.

Figure 17: Formulation of Nano cream

Figure 18: Microscopic view of Nano cream

WASHABILITY TEST

The cream applied on skin was easily removed by washing with tap water.

PH TEST:

The pH range of the cream formulation is between 6 to 8 which was good for skin pH. The nano cream formulation was shown pH nearer to skin required pH 7. This is an indication that the formulation may not cause skin irritation

IRRITATION TEST

The irritation test for nano cream was carried out on volunteers.The preparation that were applied to volunteers were nano creams with AgNP's extract of brown seaweed. Nano cream does not show any irritation reaction either primary or secondary irritation, in the form of redness, itching and skin roughening after 24 hours of attachment . It can be concluded that the nano cream is safe to use.

HOMOGENECITY TEST

The homogenecity test was carried out to ensure that all of the ingredients in the nanocream were homogeneously mixed so that they have the same dose when used. The homogenecity test measurement is based on visual observation of the particle

distribution. Under the microcopic observation the nanocream shown as a homogeneous mixture with no grids.

TEST FOR ANTIMICROBIAL ACTIVITY OF NANOCREAM

The zone of inhibition against skin infection causing microorganisms like *Staphylococcus aureus* and *Candida albicans* were tested and shows as good antimicrobial agent.

Table 5: Antibacterial activity of nano cream

S.NO	Concentration in µl	Zone of inhibition in (cm)
1	10	2
2	20	2.5
3	30	2.5
4	40	2.6

Table 6: Antifungal activity of the nano cream

S.NO	Concentration in µl	Zone of inhibition in (cm)
1	10	2.5
2	20	1.5
3	30	1.5
4	40	1.5

Figure 19: Antibacterial activity

Figure 20: Antifungal activity

DISCUSSIONS

The Formulation and evaluation of a nanocream utilizing silver nanoparticles extracted from brown seaweed involve several important aspects. The formulation process of the nanocream, including the selection of ingredients, preparation methods, and the evaluation process to ensure its effectiveness and safety. The preliminary phytochemical analyses were done to check the presence of primary and secondary metabolities like alkanoids ,tannins, sterioids, glycosides and carbohydrates in brown

seaweed as the primary ingredient is the silver nanoparticles extract was derived from brown seaweed. The antioxidant activity is carried out and it shows that brown seaweed has rich antioxidant properties .Since, the nanocream will be in contact with the skin, it is important to evaluate the AgNP toxicity. Hemolysis asssay was conducted using sheep blood to determine the potential adverse effects which shows no toxicity. Other components includes a base cream or, emulsifiers, stabilizers, and preservatives. The choice of these ingredients should are based on their compatibility with the silver nanoparticles and their intended function in the nanocream.The preparation of the nanocream involves incorporating the silver nanoparticles extract into the base cream. The goal is to achieve uniform dispersion of the silver nanoparticles throughout the cream to maximize their potential benefits. The effectiveness of the nanocream can be evaluated through several parameters. Which includes physicochemical characterization to determine presence of the silver nanoparticles in the nanocream. UV -Vis Spectroscopy method is used to determine the presence of silver nanoparticles .The antimicrobial properties of the silver nanoparticles were evaluated through agar well diffusion method against skin infection causing microorganisms.The evaluation of the cream is determined to ensure its physical properties, pH, Washability, homogenecity and irritation level.

CONCLUSION

The formulation and evaluation of a nano cream utilizing silver nanoparticles extracted from brown seaweed show promising potential in various applications. The incorporation of silver nanoparticles into a cream base offers several advantages, including enhanced stability, prolonged release of active ingredients, and improved skin penetration. The formulation process involves the preparation of silver nanoparticles through a reliable and eco-friendly synthesis method using brown seaweed extract. The nanoparticles are then incorporated into a cream base, ensuring uniform dispersion and optimal delivery to the skin. The cream's composition is carefully designed to provide desirable theological properties, pleasant sensory attributes, and compatibility with the skin. The evaluation of the nano cream involves several parameters, including physicochemical characteristics, stability, safety, and efficacy. Physicochemical tests assess the cream's particle size, zeta potential, and morphology, confirming the successful formation and stability of the silver nanoparticles within the cream. Stability studies confirm the cream's shelf life and its

resistance to physical and chemical changes over time. Based on the formulation and evaluation process, the nano cream utilizing silver nanoparticles extracted from brown seaweed demonstrates significant potential as a skincare product. However, further research and clinical studies are necessary to validate its efficacy, safety, and long-term effects. Additionally, regulatory considerations and manufacturing scalability should be addressed to ensure the product's commercial viability and widespread availability. Overall, the formulation and evaluation of nano cream using silver nanoparticles extracted from brown seaweed present an exciting avenue for the development of innovative and sustainable skincare solutions.The present project stated that the brown seaweed has rich antioxidant, phytochemical and antimicrobial properties.The AgNP extract from this brown seaweed exhibits enhanced nanocream formulation . The formulation and evaluation of the nanocream using silver nanoparticles extracted from brown seaweed involve careful ingredient selection, preparation methods, and comprehensive evaluation of physicochemical properties, antimicrobial activity, stability and safety considerations . By following these steps, a well-developed and safe nanocream can be formulated for potential use in the cosmetic industry.

ACKNOWLEDGEMENT

The success and final outcome of this project required a lot of guidance and assistance from many people and I am extremely privileged to have got this all along the completion of my project. First and foremost, I would like to express my sincere gratitude to my supervisor **Dr. R. Manju , Associate Professor, Department of Microbiology, Hindusthan College of Arts & Science,** for her keen interest, inspiring guidance, constant encouragement and wholehearted support throughout the completion of the work. I express my deep sense of gratitude and profound thanks to our Hindusthan management and to **Dr. A. Ponnusamy, Prinicipal, Hindusthan College of Arts and Science, Coimbatore – 641 028.** I wish to record my deep sense of gratitude and profound thanks to **Dr. Lali Growther, Head of the Department, PG and Research Department of Microbiology, Hindusthan College of Arts and Science, Coimbatore – 641 028** for providing the opportunity to do project within the department. I extend my thanks to all faculties of Department of microbiology, Hindusthan college of arts and science, Coimbatore – 641 028 for their constant help and support during my masters. I extend my thanks to all the Research Scholars of

Department of Microbiology, Hindusthan College of Arts & Science, Coimbatore, 641 028 for providing the proper working instructions on instruments. I express my heartfelt gratitude to my loved one, family and friends for their constant encouragement, prayers and support during the course of my project.

REFERENCES

1. Rajagopal, G., Manivannan, N., Mahalingam, S., Anand, K., Senthilkumar, S., Mathivanan, N., ... & Ilango, S. (2020). Biogenic Synthesis of Silver Chloride Nanoparticles from Padina gymnospora and their Evaluation of Antimicrobial, Larvicidal, Hemolytic and Anticancer Activities.

2. Rout, S. R. A. D. H. A. S. I. N. I., Rath, B. A. N. D. A. N. A., Kumar, A. N. J. A. N., Bhattamisra, S. K., & Panda, J. N. Y. A. N. A. R. A. N. J. A. N. (2020). Preliminary phytochemical analysis of the crude extract of Sargassum wightii. *Int J Sci Dev Res*, *5*(11), 227-30.

3. Rahman, I. R., & Herdaningsih, S. (2021). Formulation And Physical Properties Test Of Nano Cream Preparation Purified Extract Of Kenikir Leaf (ETDK) And Tampoi Fruit Peel Extract (EKBT). *Jurnal Ilmiah Farmako Bahari*, *12*(2), 160-168.

4. Bharathiraja, B., Devaki, P., Dheepa, S., Mageshwari, R., Jayamuthunagai, J., Chakravarthy, M., ... & Praveenkumar, R. (2016). Environmental eco-friendly marine resource macro algae (Seaweeds): an omnipotent source for value added products and its applications-A review. *Int J Curr Microbiol Appl Sci*, *5*, 19-47.

5. Pereira, L. (2018). Biological and therapeutic properties of the seaweed polysaccharides. *International Biology Review*, *2*(2).

6. Shannon, E., & Abu-Ghannam, N. (2019). Seaweeds as nutraceuticals for health and nutrition. *Phycologia*, *58*(5), 563-577.

7. López-Hortas, L., Flórez-Fernández, N., Torres, M. D., Ferreira-Anta, T., Casas, M. P., Balboa, E. M., ... & Domínguez, H. (2021). Applying seaweed compounds in cosmetics, cosmeceuticals and nutricosmetics. *Marine drugs*, *19*(10), 552.

8. Roy, S. (2019). A review: green synthesis of nanoparticles from seaweeds and its some applications. *Austin J Nanomed Nanotechnol*, *7*(1), 105.

9. Hashemi, S., Givianrad, M. H., Moradi, A. M., & Larijani, K. (2015). Biosynthesis of silver nanoparticles using brown marine seaweed Padina boeregeseni and evaluation of physico-chemical factors.

10. Devi, J. S., Bhimba, B. V., & Peter, D. M. (2013). Production of biogenic silver nanoparticles using Sargassum longifolium and its applications.

11. Marslin, G., Selvakesavan, R. K., Franklin, G., Sarmento, B., & Dias, A. C. (2015). Antimicrobial activity of cream incorporated with silver nanoparticles biosynthesized from Withania somnifera. *International Journal of Nanomedicine*, 5955-5963.

12. Adeleye, O. A., Badru, A. O., Oyinloye, O. E., Fagbohun, A. B., Bakre, L. G., Bamiro, O. A., ... & Lateef, A. (2020, March). Green synthesized silver nanoparticles for cream formulation: its anti-inflammatory and healing activities. In *IOP Conference Series: Materials Science and Engineering* (Vol. 805, No. 1, p. 012016). IOP Publishing.

13. Al-Momani, R. M., Arabeyyat, Z. H., Malkawi, E. E., & Alzibdah, M. K. (2022). Formulation and evaluation of herbal antioxidant face cream using extract of the marine seaweed Sargassum spp.(Phaeophyceae). *Journal of Research in Pharmacy*, *26*(4).

14. Sumaiyah, S. (2021). Formulation and Evaluation of Skin Anti-aging Nanocream Containing Canola (Brassica napus L.) Oil. *Indonesian Journal of Pharmaceutical and Clinical Research*, *4*(1), 47-58.

15. Mathur, P., Jha, S., Ramteke, S., & Jain, N. K. (2018). Pharmaceutical aspects of silver nanoparticles. *Artificial cells, nanomedicine, and biotechnology*, *46*(sup1), 115-126.

16. Rajeshkumar, S., Kannan, C., & Annadurai, G. (2012). Synthesis and characterization of antimicrobial silver nanoparticles using marine brown seaweed Padina tetrastromatica. *Drug Invention Today*, *4*(10), 511-513.

17. Pawar, M. S. T., Bhagat, M. V. P., Jadhav, M. V. A., & Rode, M. A. R. FORMULATION AND EVALUATION OF MOISTURIZING CREAM.