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FORMULATION DEVELOPMENT AND EVALUATION OF *ALOE BARBADENSIS* WITH *SOLANUM LYCOPERSICUM* EXTRACTS ON PREPARED POLYHERBAL MOISTURIZING CREAM

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Abstract: The pharmaceutical creams plays an important role on tropical applications in which moisturizers are one of the widely industrial preparations involved for to nourish, soften and moisten the skin for the clients by which the skin smooth and hence maintaining a normal pH of skin. This current study has been taken to investigate polyherbal moisturizing creams interaction with the aloe vera gel and lycopene along with its base as control utilizing W/O emulsion process providing the synergistic effects of natural creams. The extracts of aloe vera and lycopene tests were being tested by chemical tests. The quality of all products was being formulated assessed by using different evaluation techniques. Hence, behalf of all formulation developed potentials, all are more stable and safe to use in which F_3 who have shown their excellent appearance and compile with being passes maximum evaluation techniques while compairing with other batches.

Keywords – Moisturizers, dry skin, investigate, synergistic effects, quality, bumping, effectiveness, batches.

I. INTRODUCTION

Pharmaceutical cosmetics are refers to the products being generally required to beautify the skin and to purify the skin. The word cosmetics derived fron Greek word “Kosmesticos” which mean to adorn [1]. Creams are defined as those semisolid emulsions are under oil in water (O/W) or water in oil (W/O) type of emulsions which are intended for external application. It is applied on outer part or the superficial part of the skin and its main ability is to remain for a longer period of time at the site of application face [2]. The main aim of our work is to develop herbal cream which can give multiprotective effects, such as reduced dust, dirt, moisture, pimples, acne, skin irritation and even microbes free to reduce skin roughness or from flaky or dry patches generated during environmental conditions in winter or other such environmental factors and even additional glow to the face [3]. A moisturizer is actually a cosmetic preparation used to moisten, protecting and lubricating the skin and even has its liquid property that is used for softening the skin, especially prepared naturally for dry skin clients usually included in moisturizers with the purpose of enhancing the water-binding competency of the Stratum corneum (SC) of skin [3,4]. They enhance the skin’s water content in the epidermis by reducing evaporation which are basically designed to either impact or restore hydration [4]. They are several varieties of them available in market, most of the available use synthetic adhesives,

emulsifiers, perfuming agents, pigments, surfactants and thickeners to form this cream base. There is extensive need to replace toxic syntheic agent instead of using natural herbs [5].

Aloe Vera has been extensively used in health foods, cosmetics and traditional medicines shows its moisturizing property with various substances including anti-inflammatory, anti-oxidative, anti-aged, anti-cancer, immunomodulatory and face glowing properties [6]. Reports credit that Aloe gel action as a moisturizing agent still popular among which aloesin inhibits human tyrosinase activity via non-competitive inhibition mechanism and also contains important ingredients necessary for wound healing such as vitamin C, vitamin E, amino acids and zinc under which they are helpful in synthesis enhancement of collage and counter balances collagen breakdown [7]. Tomato extract lycopene been recently used as a pigment that have potent anti-oxidant properties which is also responsible for red colour in several fruits and vegetables. In some cases, it also possesses anticancer and anti-microbial properties [9]. In respite of tropical application of lycopene before UV exposure reduced photodamage and have certain health benefits are attributed to its ability to protect cells against oxidative damage. Addition widely employed in cosmetic formulations due to its photoprotective properties against photodamage and skin aging [9].

The objective of this study is to formulate the polyherbal moisturizing cream with reduced side effects than allopathy drugs and combine aloevera gel extract with lycopene extract among with various other excipients to get beneficial synergistic maximum effect. The aim study is to give affordable alternative to costly synthetic medicines for the common people with various suffering skin problems patients and healthy individuals.

II. MATERIALS AND METHODS

2.1 Materials

Aloe Vera (These were grown & obtained and collected from my home lawn used for the study and need of extracts), Tomato (These were being buyed and collected from the local market grocery shop used for the study and need of extracts), Emulsifying Wax Flakes (Prathna Naturals and Handmade Pvt. Ltd., Pune, India), Tocopheryl Acetate (Procter & Gamble Health Ltd., Ponda, Goa, India), Artificial Vanilla (Essence Garden Flavours Co. Pvt. Ltd., Navi Mumbai, India), Coconut Oil, Almond Oil, Eucalyptus Oil, Borax, Pure White Bees Wax, Cocoa Butter, Ascorbic Acid, Ethanol and Distilled Water were being provided by the Royal College of Pharmacy (Raipur, Chattisgarh, India)

2.2. Method of herbal extractions

2.2.1. Preparation of Aloe vera gel extract from *Aloe barbadensis* leaf:

The *Aloe barbadensis* leaf gel extract was prepared by centrifugation method [10]:

(A) Plant material: Matured Aloe vera whole leaves are used as the plant material. The identification of this plant by performing phytoscreening chemical tests was confirmed in Royal College of Pharmacy, Raipur, Chattisgarh, India.

(B) Cutting: The freshly harvested leaves of Aloe vera were cut manually in the early morning for experimentation. To avoid bio-degradation the Aloe vera leaf is harvested and pulled carefully from the mother plant so as not to break the rind and immediately after cutting the leaves were kept in the ice box at 4-5°C and transported to the laboratory. The leaves were thoroughly washed with fresh water. The outer skin and the exudates of the leaves were removed manually with the help of knife to form fillet.

(C) Trimming: The domestic blender (mixer or boss hand blender) was used to ground the fillets to obtain homogenised pulp.

(D) Centrifugation: The 60 ml pulp on volume basis was centrifuged in cooling type centrifuge for separation of crude gel and fiber. In this process, the temp. must be at 5°C, rotation of this instrument must 10,000 rpm speed under 30 minutes duration.

(E) Purification and storage: In this, the 0.1g charcoal was mixed wixed with 100 ml of crude gel for purification. The vacuum filtration method was used to obtain pure gel from crude gel. The pure gel was collected for further experimental analysis and store in air tight bottle at 4°C.

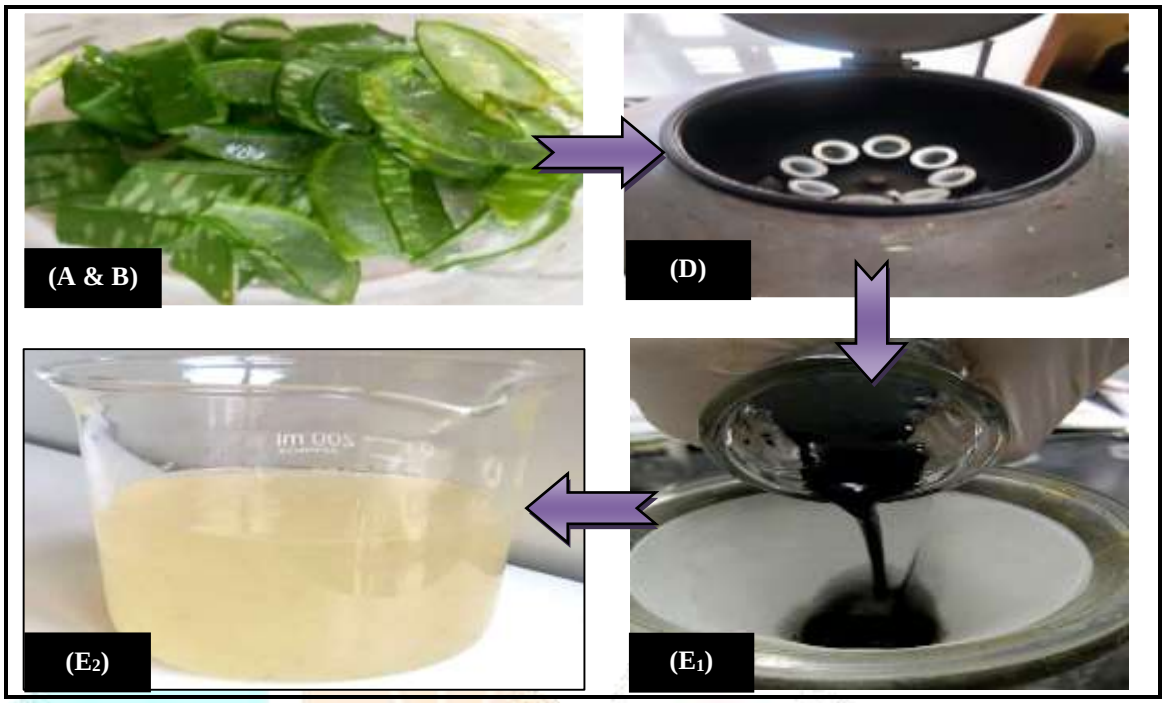


Figure 1: Extraction processing steps of Aloe vera gel obtained from *Aloe barbadensis* plant.

2.2.2. Preparation of Lycopene powder extract from *Solanum lycopersicum* fruits:

The *Solanum lycopersicum* fruits extract was prepared by simple solvent extraction method [11, 12]:

(A) Plant material: Matured bright riped red fruits of tomato are being used as the plant material. This riped fruits has been buyed from the local grocery shop. The identification of this plant by performing phytoscreening chemical tests was confirmed in Royal College of Pharmacy, Raipur, Chattisgarh, India.

(B) Tomato paste: 500g of tomatoes were washed under running stream of water for 5 minutes to remove all dust, dirt and foreign materials attached to the surface. De-heading and crushed using a blender for ± 2 mintes untill smooth processed into fine paste. This tomato pure paste was heated on a water bath while stirring for 1 hour. This extract is produced by crushing tomatoes into crude tomato juice that is then separated into serum (needed part) and pulp.

(C) Simple solvent extraction: This conventional method involved the simple application of organic solvents to the samples for lycopene extraction. About each paste was taken in the conical flask. Then these samples were extracted overnight macerated in the final product is obtained after solvent mixer of 200ml of hexane and acetone in the ratio of 75:25 respevtively at room temperature. This extract from each flask was filtered with Whatman filter paper (by M. B. Hussain *et al*). The final product is obtained after removal by evaporation process under vacuum at 40-60°C (by Dr. Rath Susanne *et al*). Lycopene extract from tomato is a *dark-red viscous* liquid which produced from a tomato variety with high lycopene content. The crude extract of each sample was stored at 4°C until rise.

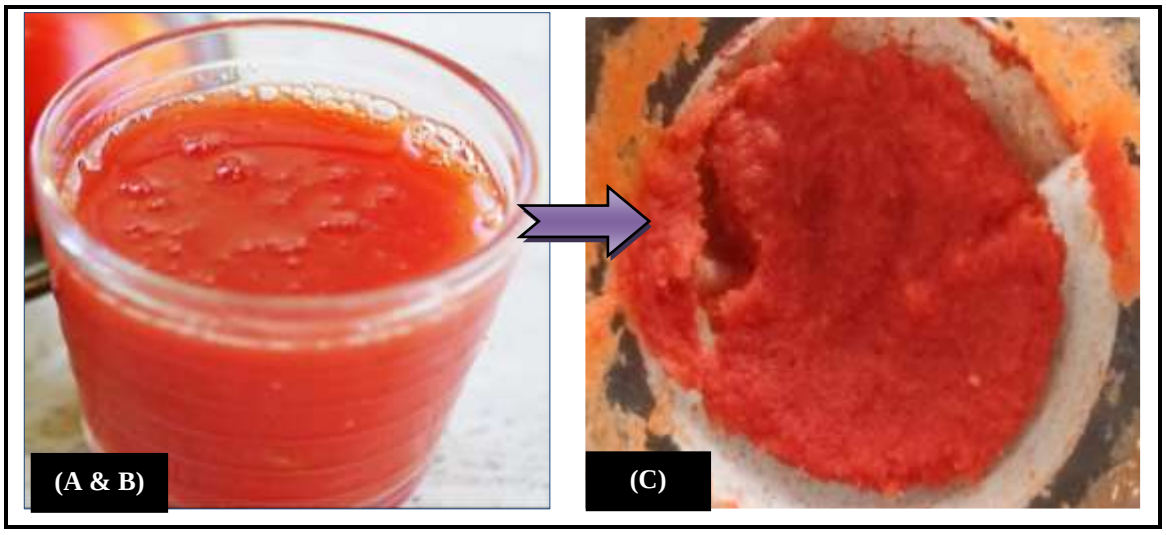


Figure 2: Extraction processing steps of Lycopene powder extract obtained from *Solanum lycopersicum* fruits.

2.3. Formulation Development

2.3.1. Selection of Base:

Cosmetic moisturizing cream was a high-level performance product based on W/O. The use of this application was to achieve the effects of cosmetic that contains physical satisfaction through which results were be seen instantly [13].

2.3.2. Methods of Preparation:

At first, all the formulation of polyherbal moisturizing cream was to collect and arrange different glasswares (such as beakers, spatula, measuring cylinder, petri dish, etc.) and equipments (such as weighing machine, spatula, heating mantle, etc.). After that, the pure extracts of Aloe vera gel and Lycopene were taken previously from their botanical sources as well as other ingredients were taken [3, 14]. In this study, W/O emulsions formulation was being prepare by the addition of two different phases with continuous agitation were as follows while applying under different formulations pattern shown as per given in Table 1 [15, 16, 17]:

→ All the apparatus and chemicals should be washed and cleaned as per SOP.

→ All ingredients were weighed properly in a separate phase.

→ **Phase-1:** Oily phase consisted by melting all the solid/waxes ingredients and surfactant by indirect heated up to 75°C±1°C then add all the oils in it and stir well.

→ **Phase-2:** At the same duration, aqueous phase consisting of borax which dissolved in distilled water was heated at same temperature and then the Aloe Vera gel extract, Lycopene extracts and Vitamin C was added in it.

→ While still hot add the phase-1 into the phase-2 gradually with constant stirring to the wax and oil mixture until complete addition takes place.

→ Add some drops of preservative and essence were added during this stirring time to give good fragnance effect to the formulation.

→ Continue this process for 5 minutes, stir all the time then remove from the heat for complete homogenization and stir until it gets moisturizing. As compared to other creams this cream may be made heavier by adding more wax.

→ Cream base was also been prepared by the same above method and with same ingredients but without Aloe Vera gel and Lycopene extracts. It's simple W/O base selected, so that it doesn't interfere with the evaluation of moisturizing Active property.

→ The various types of batches mainly divided and named as F_1, F_2, F_3 and F_4 formulations of polyherbal moisturizing cream as well as evaluation parameters for each batch done separately.

Table 1: Formulation development of polyherbal moisturizing creams.

Sr. No.	Ingredients	Quantity/Amount for 200 gm (% W/W)			
		Formulation Codes			
		F_1/CB	**F_2**	**F_3**	**F_4**
	***Aqueous Phase*:**				
1	Aloe vera gel*	---	10	3.8	6.2
2	Lycopene powder*₹	---	6.2	3.8	10
3	Powdered borax	15	15	15	15
4	Distilled water (to make)	q.s.	q.s.	q.s.	q.s.
5	Vitamin C	3.5	3.5	3.5	3.5
	***Oily Phase*:**				
6	White Bees Wax (Pure)	15	15	15	15
7	Cocoa Butter	6.8	6.8	6.8	6.8
8	Emulsifying wax₹	6	6	6	6
9	Coconut oil	1.5	1.5	1.5	1.5
10	Almond oil	1.5	1.5	1.5	1.5
11	Eucalyptus oil	1.5	1.5	1.5	1.5
12	Vitamin E oil₹	1.57	1.57	1.57	1.57
13	Vanilla essence₹	12	12	12	12
14	Ethanol	0.025	0.025	0.025	0.025

Where, * : Extracted before from its original botanical sources brought from my local residence
₹ : Itself buying by the online/offline format way
F_1 : Formulation 1
F_2 : Formulation 2
F_3 : Formulation 3
F_4 : Formulation 4
CB : Cream Base
q.s. : Quantity sufficient or Quantity as required

Note: The rest of the materials and ingredients were been provided by the RCP, Raipur (C.G.)

Figure 3: All 4 formulated polyherbal moisturizing creams.

III. EVALUATION OF HERBAL SKIN CREAMS

3.1. Organoleptic appearance:

This refer to the formulated manual emulsion of the cream's physical characteristics was to be analyzed/observed visually by its colour, odour, texture/consistency and state were carried out. The appearance of the cream was measured and graded by its roughness and colour which were kept for long time [13, 18].

3.2. Determination of pH:

The pH value of a solution was determined potentiometrically by means of a glass electrode, a reference electrode and a digital pH meter. The pH meter was operated according the manufacture's instructions. First, the apparatus was standardized by calibration using buffer solutions of pH 4, 9 and 7. After that the pH of the 10% w/v cream suspension was taken which dissolved in demineralized water as a solvent in a suitable beaker and determined at room temperature. The electrodes were immersed in the solution and measured the pH [19].

3.3. Viscosity:

The viscosity of all creams can be determined by using Brookfield Viscometer with helipth stand was used for rheological studies. The sample was allowed to equilibriate for 5 minutes before measuring the dial reading at a temperature of 25°C using spindle No. 63 at 2.5 r.p.m. [20]. At each speed, the corresponding dial reading on the viscometer was noted. Direct multiplication of the dial readings with factors given in the Brookfield Viscometer catalogue gave the viscosity in centipoises [21].

3.4. Homogenicity:

The homogenicity of all creams can be assessed by smearing 1 gm of preparations onto a clean object-glass, showing a homogeneous arrangement with no clear grain observation which should spread uniformly. The immediate skin feel was also assessed, which includes stiffness, grittiness and greasiness and there should not be any unmixed particles or lumps [19].

3.5. Phase Separation:

The prepared formulated cream was transferred into a suitable wide closed mouth container at a temperature of 25-100°C away from light which set aside for storage the oil phase and aqueous phase separation were visualizing after 24 hrs. Any change in the phase separation was observed/checked [20].

3.6. Spreadability test:

The spreadability of test samples was determined using the following technique in which adequate amount of 0.5 gm sample formulation was placed within a circle of 1 cm diameter pre-marked on a glass plate over which a second glass plate was placed. A weight of maximum 500 gm was allowed to rest on the upper glass plate for 5 minutes. The increase in the diameter due to spreading of the test formulation was noted [21].

$$\text{Spreadability} = \frac{\text{Standard weigh tied to upper slide (m)} \times \text{Length of glass slide (l)}}{\text{Time taken to separate slides (t)}}$$

3.7. Washability/Removal test:

It was carried out by ease small amount extends of removal of the formulated creams applied was examined by washing the applied part under running tap water [22].

3.8. Irritancy/Irritability test:

Make an area of 1 cm^2 on the left-hand dorsal surface. Then the prepared formulated cream was applied to that specific area and time was noted. Then it is checked for itchiness, erythema and edema on the contact skin was checked, if any, for regular intervals upto 24 hrs. and reported [22].

3.9. Centrifugation test:

In this, 5 to 10 grams of sample were centrifuged at 3000 r.p.m. for 30 minutes at room temperature. The formulation was examined for phase separation after the centrifugation process, which is an indicator of formulation instability which is denoted by the presence of caking, coalescence and flocculation. In this, all creams being performed for the sample of base and formulation kept at different storage conditons at an interval of 28 days period of time. Meanwhile, evaluated both organoleptic (look, colour, feel & thickness) and physical (phase separation and creaming) properties [23].

3.10. Light test:

The formulation were placed in clear plastic containers and exposed to intense light for 15 days using a day light bulb with a photoperiodicity system consisting of 16 hrs. of light and 8 hrs. of dark. The samples were analyzed for any changes in physical properties, such as clarity, appearance or colour, as well as liquefication, at the end of the exposure period. Any visible phase separation or colour change is an indication of product instability [23].

3.11. After feel test:

Emoliency slipperiness and amount of residue left after the application of the fixed amount of cream was to be observed/checked [20, 24].

3.12. Type of smear/film determination:

After application of all creams, the type of film/smear formed on the skin surface were observed/checked of a human volundeer and observing its greasiness and behaviour on the skin, if the smear was only or greasy like [18].

3.13. Sensitivity and its exposure irritation test:

The prepared formulated cream was applied on 1 cm skin of hand and exposed to sunlight for 4-5 minutes. Even claims that "self, no ethical permission need due to non-toxic, natural, and safe components which makes it exceptional" applying the cream on the surface of the cream of the person's volundeer (Puja Saha; Supriyo Das *et al.*) [18, 19].

3.14. Dye test:

In this, the scarlet red dye is mixed with the cream. Place a drop of cream on a microscopic slide and then covers it with a cover slip, and examines it under a microscope. If the disperse globules appers red and the ground colourless, then the cream is O/W type and the reverse condition appears in W/O type of cream i.e. the disperse globules appear colourless in the red ground [22, 25].

3.15. Acid value determination:

In this, the 10 gm of substance is dissolved in accurately weighed 50 ml mixture of equal volume of alcohol (ethanol) and solvent ether (diethyl ether), the flask was connected to reflux condenser and slowly heated, until sample was dissolved completely, to this 1 ml of phenolphthalein added and titrated with 0.1N NaOH, until faintly pink colour appears after shaking for 30 minutes [22, 26].

$$\text{Acid value} = \frac{\text{No. of mL of 0.1N KOH solution} \times 5.61}{\text{Weight of substance (gm)}}$$

3.16. Sapnification value determination:

The 2 gm of substance refluxed with 25 ml of 0.5N alcoholic KOH for minutes, to this 1 ml of phenolphthalein added and titrated immediately, with 0.5N HCl, note the reading as 'a'. Repeat the operation omitting the substance being examined. Repeat the operation omitting the substance being examined, marking the result reading note as 'b' [22, 26].

$$\text{Saponification value} = \frac{\text{(b-a)} \times 28.05}{\text{Weight of substance (gm)}}$$

Where, b = Volume of titrate in omitted condition (no cream involved), and
a = Volume of titrate (cream involved)

3.17. Hard and sharp edged abrasive particles:

Take about 15 gm paste sample on a plain paper. Test the paste by spreading on paper by a finger for positive of hard and sharp edge abrasive particles. The formulated sample cream shall be free from hard and sharp edge abrasive particle which can be feel by finger [19].

3.18. Total fatty substance (TFS) content determination:

In this, weigh accurately about 2 gm of the material into a conical flask, add 25 ml of dilute HCl, fit a reflux condenser into the flask and boil the contents until the solution is clear. Pour the contents of the flask into a 300 ml-separating funnel and allow it to cool at 28°C. Rinse the conical flask with 50 ml of Petroleum ether in portions of 10 ml. Pour the petroleum ether rinsing into the separating funnel, shake the sparating funnel well and leave until the layers separate. Separate the aqueous phase and shake it out with 50 ml portions of Petroleum ether twice. Combine all the petroleum ether extracts and wash them with water until free of acids (when tested with methyl-1-orange indicator solution). Filter the Petroleum ether extracts through a filter paper containing Na_2SO_4 (Sodium sulphate) into a conical flask which has been previously dried at a temperature of 90 ± 2°C and then weiged. Wash the Na_2SO_4 on the fiter with Petroleum ether and combine the washing with the filtrate. Distill off the Petroleum ether and dry the material remaining in the flask at a temperature of 90 ± 2°C at constant mass. The acceptance measurement range is given accoding to BIS that not more than 5% by mass requirement [13, 27].

$$\text{TFS (\% by mass)} = \frac{\text{Mass in gm of the residue (M1)}}{\text{Mass in gm of the material taken for the test (M2)}} \times 100$$

3.19. Non-volatile/Residue content determination:

In this, weigh accurately about 5 gm of the material in a weighed, clean and dry large squat form weighing bottle and heated on a steam bath under a jet of air for 30 minutes. Then dry to constant mass was continued at 105 ± 1°C in an oven of 2 hours. Cooled in a desiccator and weighed. The acceptance measurement range is given accoding to BIS that not more than 10% by mass requirement [26, 27].

$$\text{Residue (\% by mass)} = \frac{\text{Mass in gm of the residue (M1)}}{\text{Mass in gm of the material taken for test (M2)}} \times 100$$

3.20. Ash value:

Ash measurement is an indicator of the effectiveness of the demineralization (DM) step for removal of $CaCO_3$. In this, 5 gm of each formulation was weighed in a flat-bottomed silica crucible and heated on a steam bath under a jet of air for 1 hour. Then, 1 gm of ash less cellulose powder was added to it and mixed with a glass stirring rod. The dish was heated at 600°C in a muffle furnanace and the ash obtained was examined [26].

3.21. In vitro occlusivity test (F):

In this, each beaker with a diameter 3.2 cm and height 4.6 cm were used. The test was performed by placing 10 gm of distilled water in each braker and closing the open end with Whatman filter paper (0.45 pore size) on the upper surface of which 200 mg of the sample was evenly distributed. These beakers were then placed at 37 ± 2°C/607 ± 5% RH for 48 hrs. The samples of all formulations, prototype formulations and a negative control where the filter paper was kept uncovered were studied for the *in vitro* occlusivity to determine the water flux [21].

$$F\ (\%) = \frac{A\text{-}B}{A} \times 100$$

Where, A = Water flux via uncovered filter (percent water loss), and
B = Water flux via filter when covered by test preparation (percent water loss)

3.22. Psychometric/Preference analysis:

The formulated all products were being compared based on sensory evaluation and ranking was done as per the score to be obtained the degree according to the Hedonic scale given in the Table-2. The parameters of psychmetric/preference analysis were involved colour, odour, texture, wetness, spreadability, thickness, absorbency, gloss, stickness, slipperiness, firmness and skin sensation [23, 26].

Table 2: Hedonic scale values for grading the products while dispencing formulations of moisturizers.

Grade	Score
Extremely liking	8-9
Between extremely liking and medium	7
Medium/Neutral	5-6
Between medium and dislike	4
Dislike extremely	1-3

3.23. Freeze thaw test:

In this, all herbal creams is placed in freeze at low temperature and then cream was placed at room temperature. This cycle was repeated for 5 times and changes were observed/checked by visual appearance [28].

3.24. Thermal stability test:

In this with help of spatula, insert the cream into glass bottle and tap it to settle to the bottom. Fill up to two-third capacity of bottle and insert plug and tighten the cap. Keep the filled bottle erect in side the incubator measures at 20°C, 30°C and 40°C for 48 hrs. was determined according to Bureau of Indian Standards (BIS) and Indian Standard Guideline (ISG) in which there is no any breaking of oil phase [13, 21, 27].

3.24. Anti-microbiological study:

Basically, tropical formulation was broad, non-resistance promoting against various microbes that can be of great use in dermatology preparation were infections are often mixed. Since formulation containing antimicrobial agents as active moiety have property to protect from microbial growth using observational study of antifungal activity of all batches which is optimised batch. First of all the MIC (Minimum Inhibitory Concentration) of the extract was carried out aginst *Candida albicans.* The herbal cream was screened aginst fungal stains of *C. albicans* by using agar disc-diffusion assay. The zone of inhibition were being measured [28, 29].

3.24. Accelerated stability studies:

According to ICH guidelines, accelerated stability examination of prepared formulations were subjected to testing was conducted for a duration of 2 weeks most stable formulations at room temperature of 25 ± 2°C and 40°C ± 2°C were planned and observed. They were with two relative humidity conditions, specifically at 60 ± 5% RH and 75 ± 5% RH. The formulations were kept both at room and elevated temperature and witnessed on the 7^{th} day of the evaluation parameters [18].

3.25. Statistical technical data analysis:

The measured values observed and obtained for different analytical parameters includes pH, viscosity, spreadability, acid value, saponification value, TFM value, non-volatile content, ash value, in vitro occlusivity and preference tests of determinations were being analyzed using Microsoft Excel 2007 (version 12.0) providing set of data analysis tools called the Analysis ToolPak on the PC laptop data [7, 21, 26, 30].

IV. RESULTS AND DISCUSSION

These all measurements were repeated 3 times for each formulation and where the analytical mean was taken with its Standard deviation (SD) **[Mean ± SD]**. These results were found of every formulations which was specified under given from Table 3 to 12.

4.1. Organoleptic appearance:

Table 3: Organoleptic appearance of polyherbal moisturizing creams.

Formulation Codes	Colour	Odour/Smell	Consistency	State	Roughness while rubbing
F_1/CB	White creamy base	Vanilla	Smooth	Semi-solid	Nil
F_2	Slightly pale ivory	Vanilla	Smooth	Semi-solid	Nil
F_3	Pale ivory	Vanilla	Smooth	Semi-solid	Nil
F_4	Peach	Vanilla	Smooth	Semi-solid	Nil

4.2. Evaluation parameters results of creams:

Table 4: Evaluated parameters of possible tests on polyherbal moisturizing creams.

Formulation Codes	pH of creams	Viscosity at 2.5 rpm (cPs)	Homogenicity in nature	Phase separation	Spreadability test (gm.cm/sec)	Washability test
F_1/CB	5.23 ± 0.06	4700 ± 3.24	Pass	Nil	8.14 ± 0.12	Pass
F_2	6.10 ± 0.14	4560 ± 1.60	Pass	Nil	10.17 ± 0.16	Pass
F_3	6.35 ± 0.08	5345 ± 4.05	Pass	Nil	5.81 ± 0.17	Pass
F_4	6.09 ± 0.10	2930 ± 5.57	Pass	Nil	6.78 ± 0.04	Pass

4.3. Irritancy and sensitivity exposure irritation test:

Table 5: Irritancy and sensitivity exposure irritation test on polyherbal moisturizing creams.

Formulation Codes	Irritancy test of creams			Sensitivity test under sunlight	Exposure irritation under bright sunlight
	Irritant effect/Itchiness	Erythema	Edema		
F_1/CB	Nil	Nil	Nil	Nil	Nil
F_2	Nil	Nil	Nil	Feel glossy	Nil
F_3	Nil	Nil	Nil	Sometime glossy	Nil
F_4	Nil	Nil	Nil	Little glossy	Nil

4.4. Centrifugation test:

In this evaluation study, emulsion effects were been studied which are semi-solids categories of droplets are being subjected to relative motion act as an result of Brownian motions and high density turbulances causing collusion between droplets. Each droplet should drain, when the colliding droplets are close together. Between new droplet formation and its subsequent surrounding, surfactants adsorb onto the created interface to prevent its recoalescence. All formulation moisturizing creams are being performed as such no separation or any such defects present which cause negative impact to the formulation development. This indicated that the emulsions were stable at all conditions for 28 days interval.

4.5. Light test:

Table 6: Light test on polyherbal moisturizing creams.

Formulation Codes	Light test/Photoperiodicity test of creams (15 Days)							
	Under Light bulb (16 hrs)				Under Night shade (8 hrs)			
	Physical changes	Viscosity	Clarity	Liquefied in nature	Physical changes	Viscosity	Clarity	Liquefied in nature
F_1/CB	No changes in colour & odour	Nil	Nil	Nil	No changes in colour & odour	Nil	Nil	Nil
F_2		Nil	Nil	Nil		Nil	Nil	Nil
F_3		Nil	Nil	Nil		Nil	Nil	Nil
F_4		Nil	Nil	Nil		Nil	Nil	Nil

4.6. After feel and type of smear test:

Table 7: After feel and type of smear test on polyherbal moisturizing creams.

Formulation Codes	Emolliency & Slipperiness (per days inteval)					Amount of residue left after feel	Type of smear/film (per days inteval)					Greasiness under smear test	Grittiness under smear test
	0	5	10	15	25		0	5	10	15	25		
F_1/CB	G	G	G	G	P	Nil	G	E	E	E	G	Nil	Nil
F_2	G	E	E	E	E	Nil	G	G	E	E	E	Nil	Nil
F_3	G	E	E	E	E	Nil	G	E	E	E	E	Nil	Nil
F_4	G	E	E	E	E	Nil	G	E	E	E	E	Nil	Nil

Where, P = Poor, G = Good, E = Excellent

4.7 Evaluation of analytical parameters results of creams:

Table 8: Evaluated analytical parameters of possible tests on polyherbal moisturizing creams.

Formulation Codes	Dye cream test	Acid value	Saponification value	Hard & Sharp edge abrasive particles	TFS content (% by mass)	Residue content (% by mass)	Ash value
F_1/CB	W/O	5.049 ± 0.28	316.965 ± 2.14	Nil	6.0 ± 1.52	25.0 ± 0.50	0.75 ± 0.07
F_2	W/O	3.927 ± 0.24	23.842 ± 1.40	Nil	3.0 ± 1.00	12.0 ± 0.54	0.12 ± 0.01
F_3	W/O	4.488 ± 0.22	32.257 ± 0.80	Nil	2.5 ± 2.64	8.0 ± 0.24	0.08 ± 0.01
F_4	W/O	2.356 ± 0.24	28.050 ± 1.61	Nil	2.0 ± 1.58	9.6 ± 0.43	0.12 ± 0.05

4.8. In vitro occlusivity test:

Table 9: In vitro occlusivity test on polyherbal moisturizing creams.

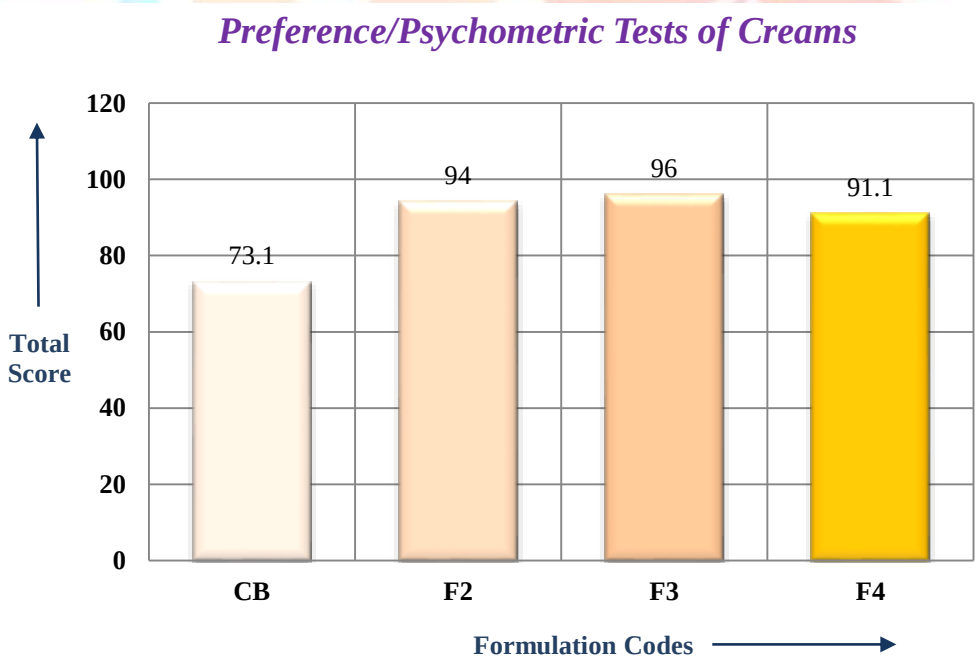
Formulation Codes	Water loss/flux via uncovered filter-A (ml)	Water loss/flux via covered filter-B (ml)	*In vitro* occlusivity (%)
F_1/CB	9.8 ± 0.11	6.1 ± 0.05	37.75 ± 0.72
F_2	9.7 ± 0.30	5.8 ± 0.10	40.20 ± 1.27
F_3	4.8 ± 0.15	4.1 ± 0.05	16.66 ± 2.08
F_4	9.9 ± 0.10	4.3 ± 0.15	42.42 ± 0.33

4.9. Psychometric/Preference analysis:

Table 10: Preference analysis on polyherbal moisturizing creams.

Formulation Codes	Psychometric/Preference test												
	C	O	T	W	Sp	Tk	Ab	Gl	Sk	Sl	Fr	Se	$\sum S$
F_1/CB	6	5	5	5	4	9	2	7	7	6	8	7	73 ± 1.52
F_2	8	6	7	7	8	9	8	9	9	8	8	7	94 ± 2.08
F_3	8	6	9	9	7	9	7	8	9	8	8	8	96 ± 0.57
F_4	9	6	6	6	8	9	6	8	9	7	9	8	91 ± 1.73

Where, C = Colour, O = Odour, T = Texture, W = Wetness, Sp = Spreadability, Tk = Thickness, Ab = Absorbency,
Gl = Gloss, Sk = Stickness, Sl = Slipperiness, Fr = Firmness, Se = Skin sensation and $\sum S$ =Average score.



4.10. Freeze thaw and thermal stability tests:

Table 11: Freeze thaw and thermal stability tests on polyherbal moisturizing creams.

Formulation Codes	At RH 65% with different temperatures conditions					Any oil phase separation observed during any period of time
	At low 4°C (Freeze thaw)	Under 20°C	Under 30°C	Under 40°C	Under 50°C (Stress study)	
F_1/CB	Stable	Stable	Stable	Stable	Stable	Nil
F_2	Stable	Stable	Stable	Stable	Stable	Nil
F_3	Stable	Stable	Stable	Stable	Stable	Nil
F_4	Stable	Stable	Stable	Stable	Stable	Nil

4.11. Anti-microbiological study:

From the microbial study, it was foung that the cream showing its best to best possible outcomes show on microbial *Candida albicans* against regional growth. The zone of inhibition was calculated as shown in table 12 along with its figure 4.

Table 12: Antimicrobiological study on polyherbal moisturizing creams.

Formulation Codes	Zone of Inhibition of cream fight against *Candida albicans* (mm)
F_1/CB	5.56 ± 0.307
F_2	23.34 ± 1.153
F_3	67.22 ± 2.731
F_4	43.32 ± 0.046

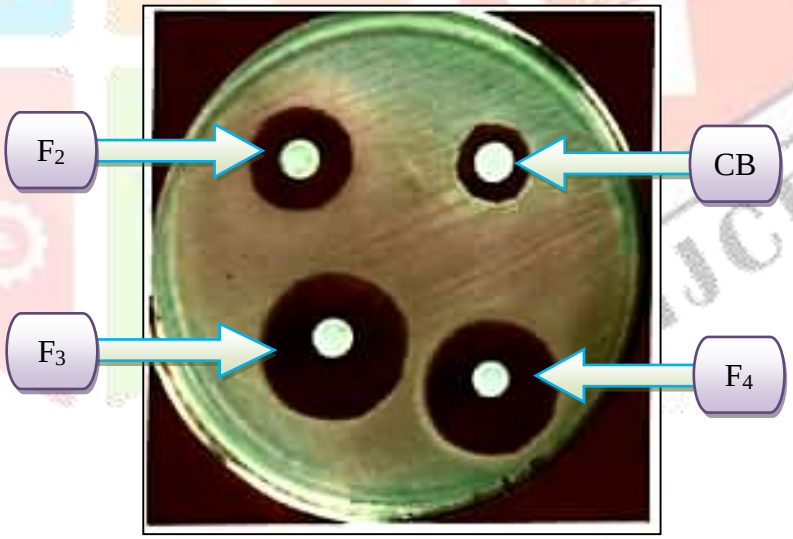


Figure 4: Zone of inhibition of polyherbal creams in *Candida albicans* culture media.

4.12. Accelerated stability studies:

Table 13: Accelerated stability studies on polyherbal moisturizing creams.

Formulation Codes	Time interval	Accelerated stability studies under which certain parameters conditions was observed/checked			
		Physical appearance	Colour	Texture/Consistency	Product degradation
F_1/CB	Initial	Semi-solid	No change	Ok	Nil
	After 7 days		No change	Ok	Nil
	After 14 days		No change	Ok	Nil
F_2	Initial	Semi-solid	No change	Ok	Nil
	After 7 days		No change	Ok	Nil
	After 14 days		No change	Ok	Nil
F_3	Initial	Semi-solid	No change	Ok	Nil
	After 7 days		No change	Ok	Nil
	After 14 days		No change	Ok	Nil
F_4	Initial	Semi-solid	No change	Ok	Nil
	After 7 days		No change	Ok	Nil
	After 14 days		No change	Ok	Nil

All the studies show that all four formulations are being stable except CB (Cream Base) along with showing standard variable deviation in parameters which makes the reading helpful to make accurate.

V. CONCLUSION

The present work concludes by focusing on the polyherbal skin moisturizing creams of *Aloe barbadensis* leaf gel extract with *Solanum lycopersicum* riped fruits extract via including coconut oil, almond oil, eucalyptus oil while added with all ingredients was being prepared and evaluated under different ratios involving water-in-oil emulsions type. The cream containing 3.8 gm of *Aloe barbadensis* gel extract and 3.8 gm of *Solanum lycopersicum* extract under F_3 composition shows the maximum efficacy effects as well as friendly with the skin surface which are being acceptable criteria according to the Bureau of Indian Standards (BIS) and Indian Standard Guideline (ISG) as well as under studies shown to being good, safe, stable more than 3 months and healthy cosmetic moisturizing cream shows maximum control effectiveness with the other ratio of formulation developed applied to human skin absorbs within hour and even fight against fungal pathogenic infections. These all analyzed commitment from above evaluation examination test results indicate that to moisturize improvement effects shown under the study of skin via applying and the method employed were seems to be easy and efficient. The statistical technical data analysis of the experimental analyzed data was carried out by bar graph where the differences were considered as statistically significant at 90% confidance level. But this results obtained in these studies may differ depending on the environmental conditions and also for quality of components used. Thus, there is a growing demand for the further analysis and in herbal cosmetics under the world's market which could rise and even tackle the appetite competition and invaluable demands in needs of society.

VI. REFERENCES

[1] B.S., Kalpesh K. Mehta, Anshu Gupta. Dispencing Pharmacy: A Practical Manual. *Pharm M. Press*. 2016.
p. 389-399.

[2] Manisha Yogesh Sonalkar, Sachin Annasaheb Nitave. Formulation and evaluation of polyherbal cosmetic cream. *World J Pharm Sci.* 2016, 5: 772-779.

[3] Navindgikar Nikhil Nitin, Kamalapurkar K. A., Chavan Prasant S. Formulation and evaluation of multipurpose herbal cream. *Int J Curr Pharm Res*. 2020, 12 (3): 25-30.

[4] Xu, S.; Kwa, M.; Lohman, M.E.; Evers-Meltzer, R.; Sliverberg, J.I. Consumer Preferences, Product Characteristics, and Potentially Allergenic Ingredients in Best-selling moisturizers. *JAMA Dermatol.* 2017, 153: 1099-1105.

[5] Loden M. The clinical benefit of moisturizers. *J. Eur. Acad. Dermatol.* 2005, 19 (6): 672-688.
[6] Xiu Z, Hong W, Yuan S, Li N, Lan W, Bin L, et al. Isolation, structure elucidation, antioxidative and immunomodulatory properties of two novel dihydrocoumarins from Aloe Vera. *Bioorganic and Medicinal Chemistry Letters*. 2006, 16: 949-953.
[7] Aktar N, Khan BA, Khan MS, Mahmood T, Khan HMS, Iqbal M, et al. Formulation Development and Moiturising Effects of a Tropical Cream of Aloe vera Extract. *World Academy of Science, Engineering and Technology*. 2011, 75: 172-179.
[8] Bhowmik Debjit, Kumar K.P. Sampath, Paswan Shravan, Shrivastav Shweta. Tomato – A Natural Medicine and Its Health Benefits. *Journal of Pharmacognosy and Phytochemistry.* 2012, 1 (1): 33-43.
[9] Franco Lourdes, Marchena Ana M, Rodriguez Ana B. Skin Health Properties of Lycopene and Melatonin. *Journal of Dermatology and Skin Sciences*. 2021, 3 (1): 26-28.
[10] Chandegara V.K., Varshney A.K. Gel Extraction from Aloe Vera Leaves. *Value Addition to Agro-Horti-Medicine Produce & Its Marketing.* 2005, 12: 166-171.
[11] Ph.D. Rath Susanne, Ph.D. Olempska-Beer Zofia, Ph.D. Kuznesof Paul M. Lycopene Extract from Tomato. *Chemical and Technical Assessment*. 2023, 320: 1-5.
[12] Hussain M. B., Ahmad R. S., Waheed M., Rehman T. U., Majeed M, Khan M. U. Extraction and Characterization of Lycopene from Tomato and Tomato Products. *RJOAS.* 2017, 63 (3): 195-201.
[13] Miss. Patil Riya A., Dr. Mahalle Suchita G., Mr. Pawar Adita S. Formulation and Evaluation of Moisturizing Cream using *Amaranthus Cruentus* Seed oil. *International Journal of Advance Study and Research Work*. 2021, 4 (3): 29-39.
[14] Mr. Pawar Siddharth Baban, Prof. Gore Aaditee, Dr. Slave Megha T. A Review on Herbal Moisturizer. *IJARIIE*. 2023, 9 (6): 1071-1082.
[15] Tangadkar Kajal Nivrutti, Karbhari Talekar Sakshi, Lahu Shinde Ashok, Prof. Suryawanshi Akshada Dilip. Formulation and Evaluation of Herbal Moisturizing Cream. *Journal of Emerging Technologies and Innovative Research*. 2022, 9 (6): k79-k98.
[16] Pegu Arup Jyoti, Mrs. Sharma Ankita. Review on Aloe Vera. *International Journal of Trend in Scientific Research and Development*. 2019, 3 (4): 35-39.
[17] Mr. Pawar Shubham Tukaram, Mr. Bhagat Vishnu Popat, Mr. Jadhav Vaibhav A., Mr. Rode Abhijit R. Formulation and evaluation of moisturizing cream. *International Research Journal of Modernization in Engineering Technology and Science.* 2023, 5 (5): 6899-6905.
[18] Saha Puja, Das Supriyo, Saha Anupam. Formulation and Evaluation of Herbal Cream For Skin Care Using Extracts of Krishna Tulsi as Active Ingredient with Anti-Microbial Activity. *Pharmwave.* 2021, 14: 35-43.
[19] Dr. Chauhan Nidhi N., Mrs. Vasaval Parul, Dr. Mohmmad Patel Shoaib. Comparision of Formulated and Marketed Herbal Creak Cream by Evaluation Parameters. *International Journal of Creative Research Thoughts.* 2020, 8 (2): 62-69.
[20] Badwaik Chandrashekhar B., Lade Updesh B., Agarwal Tikesh, Barsagade Prachi, Nandgave Madhuri, Gaddamwar Nilam. Formulation and Evaluation of Herbal Face Cream. *International Journal of Pharmaceutical Research and Applications*. 2022, 7 (1): 955-959.
[21] Maru Avish D., Lahoti Swaroop R. Formulation and Evaluation of Moisturizing Cream Containing Sunflower Wax. *International Journal of Pharmacy and Pharmaceutical Sciences*. 2018, 10 (11): 54-58.
[22] Lalita Chauhan, Shalini Gupta. Creams: A Review on Classification, Preparation Methods, Evaluation and its Applications. *Journal of Drug Delivery and Therapeutics.* 2020, 10: 281-288.
[23] Mawazi Saeid Mezail, Ann Jo, Othman Noordin, Khan Jiyauddin, Alolayan Sultan Othman, Thagfan S. Al; *et al.* A Review of Moisurizers: History, Preparation, Charactization and Applications. *MDPI.* 2022, 9 (61): 1-14.
[24] Ahshawat M.S., Saraf S. Preparation and characterization of herbal creams for improvement of skin viscoelastic properties. *Int J Cosmet Sci*. 2008, 30: 183-193.
[25] Sharma Anshul, Banyal Maneesh, Gupta Jyoti, Joshi Swati. Formulation and evaluation of herbal cold cream. *IJARIIE.* 2023, 9 (3): 2578-2585.
[26] Saraf Swarnlata, Sahu Sneha, Kaur Chanchal Deep, Saraf Shailendra. Comparative measurements of hydration effects of herbal moisturizers. *PHCOG RES.* 2010, 2 (3): 146-151.
[27] Public law: Bureau of Indian Standards Act 1986, Pub. L. No. 1972-78, Stat. 71 (21 February 1991). *Indian Standard Skin Creams-Specification*. 6608:2004, 2, p. 1-7.

[28] Shete Smita, Mohite Mukesh, Karodi Revan. Formulation and Invitro Evaluation of Herbal Skin Whitening Cream of *Glycyrrhiza glabra* Extract and *Solanum Tuberosum* Juice. *IJCRT*. 2020, 8 (4): 314-322.

[29] Pimpale Amol. Formulation and Evaluation of Antibacterilal, Antifungal Cream of Garlic Oil. *International Journal of Trend in Scientific Research and Development.* 2018, 3 (1): 849-851.

[30] Professor Arshan Hossein. Excel for Statistical Data Analysis. *Fair Use Guidelines for Educational Multimedia*. 1996: 1-5.