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An Herbal Shampoo Formulation, along with Marketed Product (Clinic Plus) Assessment and Comparison

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Abstract: ***In this research, we formulated and evaluated herbal shampoo and done comparative assessment on marketed product name of product 'clinic plus as it is cheap and commomly used product all around. People are now more conscious of the negative impacts of every component used in shampoo formulations and other cosmetic preparations. As a result, there is a rise in demand for formulations that contain natural ingredients. To evaluate its physiochemical function, which places a focus on efficacy, safety, removing dangerous substances, and replacing them with natural, safe alternatives. Hibiscus powder, henna powder, neem leaf powder, shikakai powder, reetha powder, aloe vera, lemon, orange peel powder, and other components collected to create the herbal shampoo. Additionally, distilled water, sodium chloride, and sodium lauryl sulphate were used to create a chemical shampoo.***
Wet duration, foam amount and stability, pH, skin sensitisation test, surface tension, detergency, soil dispersion after washing, antimicrobial test, and other experiments were performed to ascertain the physical characteristics of shampoos. The purpose of these studies was to evaluate the chemical and formulated shampoos' physicochemical properties.
Keywords: Herbal shampoo, Evaluation of shampoo.

I. INTRODUCTION

Throughout history, humans have utilized shampoo to cleanse their hair. The primary purpose of shampoo is as a cosmetic product. It is a hair care item that we apply daily to cleanse both the scalp and hair. Shampoo is often employed as a beautifying agent and consists of a thick solution made of detergent along with appropriate additives, preservatives, and active ingredients. Typically, it is effective on wet hair, aiding in straightening and rinsing with water. The purpose of using both types of shampoos is to eliminate dirt that builds up on the hair without stripping away the natural oils The issues related to hair are addressed by shampoos; however, synthetic shampoos contain chemical components that can have adverse effects on hair. On the other hand, polyherbal shampoos are formulated with natural ingredients that possess inherent cleansing properties. They positively impact hair without causing any negative side effects. Natural ingredients are beneficial due to their purity.

Herbal shampoos fall under consistency criteria, and based on the nature of their ingredients, they can be categorized as simple or plain shampoo, antiseptic or anti-dandruff shampoo, and nourishing shampoo, which may include vitamin C, citric acid, and protein hydrolysates. The choice of active ingredients for hair care, such as shikakai and henna powders, is determined by their ability to prevent skin damage and enhance skin quality through cleansing, nourishing, and protecting properties. Some of these additives need to be included in a shampoo formulation to improve its stability and safety. Herbal shampoo serves as a skin cleanser; however, products designed for hair cleansing can be classified into one specific category, known simply as shampoo.

They consist of water-based formulations featuring key surfactants. Their main function is to cleanse hair and serve grooming purposes. While herbal shampoos are generally more effective and safer than their chemical counterparts, they are gaining popularity among consumers. The cosmetic industry has always faced the challenge of creating shampoos that do not cause adverse effects. Another important factor to consider is the cost of these shampoos. There has been an increase in awareness among people in the cosmetics sector regarding the benefits of using herbal products, nutraceuticals, and medicines for improved well-being. Presently, there is a significant shift in the cosmetics market driven by a growing demand for herbal-based items. Numerous researchers and scholars have discovered that certain commonly found kitchen ingredients possess qualities sought after in a safe and effective cosmetic product.

Shampoos typically come in forms such as semisolid, liquid, cream, or powder. Given India's rich biodiversity, many Indians prefer to use natural ingredients for their daily routines, including hair cleaning, which involves removing dirt, scalp residue, and sebum.

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For instance, Shikakai has been utilized since ancient times for hair cleansing. Herbs have been employed since the dawn of civilization to promote health and treat ailments. Choosing the right herbal ingredients is crucial for supporting hair growth and health.

A. Anatomy and Physiology of the Hair

1) Structure of Hair:

The structure of hair comprises columns of dead, keratinized cells fused together. The shaft represents the external part of the hair that extends beyond the skin's surface. In straight hair, the shaft has a rounded cross-section, while wavy hair exhibits an oval shape, and wooly hair is characterized by an elliptical or kidney-like form. The root is the section of the hair that extends deep into the skin, reaching the dermis and occasionally the subcutaneous layer. Both the shaft and root are made up of three concentric layers.

•Medulla

It is the central part of the shaft and is generally noticeable in thick hair. It is composed of two or three rows of polyhedral cells containing pigment granules and air spaces.

•Cortex

It is located peripheral to the medulla and forms the major part of the shaft. It consists of elongated cells, containing pigment granules in dark hair while air in white hair.

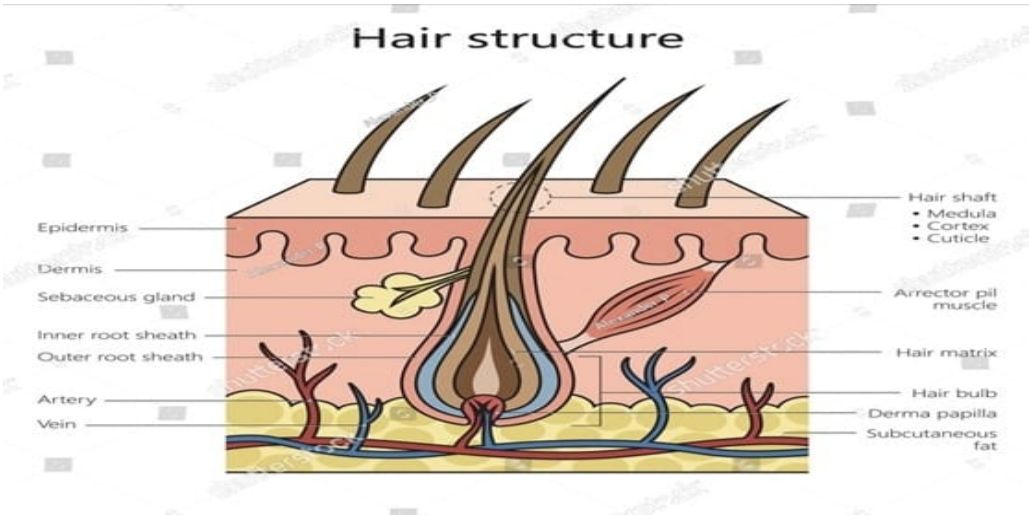
•Cuticle:

It is the outermost layer of the hair and consists of a single layer of thin, flat cells, which are heavily keratinized.

2) Physiology of the Hair:

Hair originates from the coordinated functions of multiple layers of keratinocytes within the hair follicle. The process of hair development is dynamic and cyclical, with the length of growth cycles regulated by various hormones and cytokines. This process is influenced not only by the location of hair growth but also by additional factors such as the individual's age, developmental stage, nutritional habits, and environmental changes like variations in day length. Key components of this cycle are primarily cytokines, which can direct the follicle to undergo necessary transformations, allowing each hair to exist in a different growth cycle phase compared to neighboring hairs. Hair follicles undergo repeated cycles characterized by alternating phases of rapid growth and hair shaft formation, followed by phases of apoptosis-driven regression and relative quiescence. Specifically, the hair growth cycle can be categorized into three distinct phases.

- Anagen or growth phase;
- Catagen or transitional phase
- Telogen or resting phase.



➢ Hair:

In humans, particularly among females, hair is a valued and distinctive characteristic. Its primary roles include protecting the skin from physical harm and aiding in self-care. For instance, eyebrows and eyelashes serve to block foreign objects from entering the eyes, while hair on the scalp shields the head and neck from sunlight, cold, and other forms of physical injury. Additionally, hair possesses a sensory function that enhances the skin's ability to detect tactile stimuli.

It also plays significant roles in sexual and social interactions, as evidenced by the psychological effects on quality of life associated with hair disorders such as hirsutism and hair loss. Notably, there is a markedly higher incidence of personality disorders among individuals with androgenetic alopecia compared to the general population.



- Shampoo:



A significant component of the human body's overall attractiveness is hair. Throughout history, the hair on the head has been linked to social distinction and beauty. There are countless examples from all artistic disciplines that demonstrate the unique importance that people of almost every era and culture place on hair. The process of washing hair has received relatively little attention, despite the fact that it has been cut, sculpted, and even dyed from the beginning of time. A true method for cleansing the hair and scalp has just been established in this century. In order to promote personal hygiene and body cleanliness, cake soap and sanitary facilities were first widely distributed. The specialty of branded shampoo products followed.

- Herbal shampoo:

Herbal shampoos are cosmetic preparations that, like conventional shampoos, are intended to cleanse the hair and scalp by using traditional ayurveda herbs. They are employed to remove pollutants from the environment, oils, dandruff, and filth, among other things.

- Ideal properties of shampoo:

The shampoo formulas of today go beyond simply cleaning the hair. Additional advantages, such as conditioning, surface smoothing of the hair, enhanced comb ability, and increased leather creaminess, are anticipated.

- Excessive sebum or other fatty substances, loose corneal cells, and dust or dirt should all be thoroughly and successfully removed from the hair.
- It should generate a sufficient amount of foam to meet the user's psychological needs.
- Rinsing with water should make it easy to remove.
- The hair should remain soft, shiny, and non-dry, with minimal flyaway and good manageability.
- It ought to give the hair a pleasing scent.

- Ideal characteristics of poly-herbal shampoo:
- It should wash hairs effectively
- It should remove the dust from the hairs
- It should show good foam ability d. It should provide good conditioning property with shining
- It should provide good fragrance to hairs
- It should be cheep
- It should not show side effects

B. Aim:

An Herbal Shampoo Formulation,along with marketed product (Clinic plus) Assessment and Comparison

C. Objective:

1) To formulate shampoo containing natural ingredients.
2) To formulate herbal shampoo for hair growth that strengthen the hair follicles.
3) To formulate shampoo free from harmful chemicals
4) To protect scalp and prevent hair fall
5) To study evaluation parameters for shampoo
6) Herbal shampoo for hair growth are formulated to strengthen the hair follicles by delivering seesntial oils and nourishment all through the roots and follicles. Stimulate the formation of new and healthy hair roots and promotes healthy hair growth





II. REVIEW AND LITERATURE

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III. MATERIALS AND METHODS

A. *Procurement of material:*

The different parts of the plants were selected for the study having hair care property. The plants Neem leaf powder (Azadirachta indica), Aloe vera (Aloe barbadensis), Henna powder (Lawsonia inermis), hibiscus flower powder, orange peel powder, [Shikakai powder (Acacia concinna), Ritha powder (Sapindusmukorossi). The powder of henna, Shikakai powder, Ritha powder were collected from the induce cosmaticalspvt. Ltd. Plot no. 105 hsiidc, sec-31 faridabad, 121003- Haryana (wender) orderd from wender]. The materials collected were given with their respective biological source and uses in (table no.1) ingredients in the hair care; even they are responsible to provide the nutrition to the body. Herbs have long been associated with hair care and are often ingredients of conditioners, shampoos and rinses. The selection of active ingredients for hair care powder is often based on the ability of the ingredient to prevent damage to the skin as well as to improve the quality of the skin by way of cleansing, nourishing and protecting the skin

.

B. *Method of Preparation:*

Collect the material from wendor
Analyse the sample
Preparation of herbal shampoo
Evaluation of herbal shampoo
Dispensing along with packaging

Table no.1:- Biological source and their uses of herbal ingredients.

Sr.no.	Ingredients	Biological source	Uses
1	Shekakai powder	Dried pods of Acacia concinna (Mimosaceae)	Natural cleanser, promote hair growth, maintain scalp health.
2	Reetha powder	Dried fruits of Sapindus mukorossi (Sapindaceae)	Add natural shine, strengthens hair roots.
3	Henna	Dried leaves of Lawsonia inermis (Lythraceae)	Natural colour, strengths hair
4	Hibiscus	Hibiscus rosa-sinensis (Malvaceae)	Anti-anginal property, wound healing.
5	Neem leaf	Azadirachta (Meliaceae)	Anti-dandruff, Anti-inflammatory
6	Orange peel	Citrus sinensis (Rutaceae)	Moisturizers, balance scalp ph.
7	Aloe vera gel	Dried leaves of Aloe barbadensis miller (Asphodelaceae)	Soothes scalp irritation, Promote shine and luster
8	Tulsi	Dried leaves of Ocimumsanctum (Lamiaceae)	Promote hair growth, Reduce hair fall
9	Lemon	Citrus lemon (Rutaceae)	Clean the scalp, anti-dandruff, Balance scalp pH.

Table no.2:-Ingredients and their therapeutic uses of herbal shampoo

SR. NO.	INGREDIENTS	IMAGES	THERAPEUTIC USES
1	Shekakai		1. Promotes hair growth 2. Cleanses and conditions 3. Reduces dandruff and itchiness 4. Skin care 5. Digestive health
2	Reetha		1.Natural shampoo 2. Cleanses and nourishes 3.Reduces dandruff and itchiness 4. Natural cleanser 5. Soothes skin conditions 6. Insect repellent 7. Natural detergent

3	Hibiscus		1.Antioxidant properties 2.Blood pressure management 3.Cholesterol management 4.Anti-inflammatory properties
4	Alovera		1. Soothes skin irritations and burns 2. Moisturizes and hydrates skin 3. Reduces inflammation and acne 4. Promotes wound healing 5. Relieves sunburn and eczema symptoms 6. Supports digestive health 7. May help manage blood sugar levels 8. Has antioxidant and antimicrobial properties
5	Orange Peel		1. Antioxidant properties 2. Anti-inflammatory effects 3. Antimicrobial properties 4. Digestive aid 5. Skin health benefits (e.g., reducing acne, anti-aging) 6. Natural insect repellent 7. Aromatherapy (uplifting and stress-relieving)
6	Henna		1. Skin and hair care 2. Natural dye for hair and skin 3. Antifungal and antibacterial properties 4. Wound healing 5. Soothes skin conditions (e.g., eczema, acne) 6. Hair growth promotion 7. Anti-inflammatory properties
7	Neem leaf		1. Antimicrobial and antibacterial properties 2. Anti-inflammatory effects 3. Antifungal properties 4. Skin care (acne, eczema, etc.) 5. Hair care (dandruff, lice, etc.) 6. Digestive health 7. Immune system support 8. Natural insect repellent

8	Tulsi		1. Stress relief and anxiety reduction 2. Antioxidant properties 3. Anti-inflammatory effects 4. Immune system support 5. Respiratory health benefits 6. Digestive health benefits 7. Anti-cancer properties
9	Lemon		1. Boosts immune system 2. Antioxidant properties 3. Aids digestion 4. Supports detoxification 5. Skin health benefits (acne, brightening) 6. Respiratory health benefits 7. Natural antiseptic and antibacterial properties 8. Uplifting and mood-enhancing effects
10	Sodium Lauryl Sulphate		1. Cleansing agent 2. Foaming agent 3. Emulsifier

Table No 3 : Formulation table

SR.NO	NAME OF INGREDIENTS	QTY TAKEN			USE
		F1	F2	F3	
1	Neem	15gms	10gms	8gms	Antimicrobial
2	Aloe vera	10gms	8gms	5gms	Smoothing agent
3	Hibiscus	9gms	10gms	5gms	Conditioning agent
4	Shikakai	5gms	4 gms	3gms	Antifungal, nourish follicles, dcurb dandruff
5	Reetha	10gms	8gms	5gms	Soapnut
6	Rose water	Q.S	Q.S	Q.S	Flavouring agent
7	Coconut oil	Q.S	Q.S	Q.S	Soothing agent,
8	Henna	3gms	2gms	1gms	Colouring agent
9	Lemon	3ml	2ml	1ml	Vitamin C
10	Tulsi	3gms	2gms	1gms	Anti oxidants
11	Sodium Lauryl Sulphate	Q.S	Q.S	Q.S	Forming agent

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IV. EVALUATION PARAMETERS

Prepared formulations along with marketed product (Clinic plus) were subjected to following evaluation parameters.

A. Organoleptic evaluation/visual appearance

Organoleptic evaluation for parameters like colour, odour, taste and texture was carried out. Colour and texture was evaluated by vision and touch sensation respectively. For taste and odour evaluation a team of five taste and odour sensitive persons were selected.

B. General powder characteristics

General powder characteristics includes evaluation of those parameters which are going to affect the external properties (like flow properties, appearance, packaging criteria etc.) of the preparation, Characteristics evaluated under this section are particle size, angle of repose, bulk density and tapped density. All the three shampoo powders were taken at five different level i.e. from top, middle and lower level for the evaluation.

C. Physicochemical evaluation

1) *PH:* The pH of 10% shampoo solution in distilled water was determined at room temperature 25°C. The pH was measured by using digital pH paper.
2) *Washability:* Formulations were applied on the skin and then ease and extent of washing with water were checked manually.
3) *Solubility:* Solubility is defined as the ability of the substance to soluble in a solvent. One gram of the powder is weighed accurately and transferred into a beaker containing 100 ml of water. This was shaken well and warmed to increase the solubility. Then cooled and filter it, the residue obtained is weighed and noted.
4) *Loss on drying:* Loss on drying is the loss of mass expressed in percent m/m. Two gram of the powder was weighed accurately and transferred into a dry Petri dish. The Petri dish is placed in a dessicator for 2 days over calcium chloride crystals. Then the powder was taken and weighed accurately to find out the weight loss during drying.
5) *Skin /eye irritation test:* The eye and skin irritation tests revealed that the herbal shampoo powder shows no harmful effect on skin and eye. This is due to the absence of synthetic surfactants. Most of the synthetic surfactants produce inflammation of the eyelid and corneal irritation. But in this formulation of herbal shampoo powder, the uses of all ingredients are obtained naturally. So it does not produce any harmful effect on skin and eye.
6) *Foaming Stability:*-The stability of the foam was determined using cylinder shake method. About 50 ml of formulated shampoo (1%) solution was taken in a graduated cylinder of 250 ml capacity and shaken for 10 times vigorously. Foam stability was measured by recording the foam volume of shake test after 1 min and 4 min, respectively.
7) *Surface Tension:*-Measurements were carried out with a 10% shampoo dilution in distilled water at room temperature. Thoroughly clean the stalagmometer using chronic acid and punitied water. Because surface tension is highly affected with grease or other lubricants. The data calculated by following equation given bellow:
   $R3=(w3-w1)n1 \times R1/ (W2-W1)n2 \times R2$
   Where, W1 is weight of empty beakor. W2 is weight of beaker with distilled water. W3 is Weight of beaker with shampoo solution. n1 is no. of drops of distilled water.
   n2 is no. of drops of shampoo solution. R1 is surface tension of distilled water at room temperature. R2 is surface tension of shampoo solution.
8) *Wetting time:*- Wetting time was calculated by noting the time required by the canvas paper to sink completely. A canvas paper weighing 0.44 g was cut into a disc of diameter measuring 1-inch. Over the shampoo (1% v/v) surface, the canvas paper disc was kept and the time taken for the paper to sink was measured using the stopwatch.
9) *Cleaning action :-* About 1 g of grease is spread on non-adsorbent cotton and kept in conical flask containing 1% shampoo solution. The conical flask is shaken for 1 hr in mechanical shaker. Cotton is collected, dried and weighed. The amount of grease removed is determined by using the equation given below: DP = 100 (1 – T/C) Where, C - Weight of grease in control sample. T - Weight of grease in test sample. DP-Percentage of detergency power.Instead on cotton we used artificial hairs. Applied castor oil and then washed with formulated shampoo and marketed shampoo. And determined the difference.
10) *Dirt dispersion :-* Shampoo that causes the ink to concentrate in the foam is considered poor quality; the dirt should stay in water. Dirt that stays in the foam will be difficult to rinse away. It will redeposit on the hair. The estimated amount of ink in foam was light and so results indicate that prepared formulation is satisfactory.

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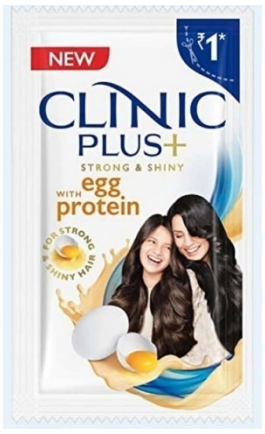
11) *Solid contents (%) :-* A Clean dry china dish was weighed and 4 grams of shampoo was added to it. The weight of dish and shampoo was noted. The exact weight of shampoo was calculated. Place the china dish with herbal shampoo on hot plate until the liquid portion was evaporated. The weight of shampoo (solids) after drying was calculated.
12) *Antimicrobial Activity:* The cup-plate method with the agar medium was used to test the antibacterial activity of the produced shampoo formulations F1 through F3. Its antibacterial action was investigated using 1% herbal shampoo as well as clinic plus shampoo. In this method the agar is melted, cooled at 45 C, inoculate with the test microorganism and then pour in the sterile petri plate. In this method when the agar plate has been solidified then holes about 9mm in diameter in the medium with sterile cork borer, Then the antimicrobial agent is placed in the hole and in another hole placed marketed formulation acts as standard, the diameter of zone of inhibition were measured after inoculation at 30-350C for 2-3 days. The diameter of zone of inhibition gives an indication of the relative activity of different antimicrobial substance against tested microorganism.

V. RESULT & DISCUSSION

The formulations of herbal shampoo were created, and various evaluation criteria done on both the products are described, including:

Physical appearance: The colour of the herbal formulation is dark brown, while the colour of Marketed shampoo (Clinic plus) is light Blue





HERBAL SHAMPOO AND MARKETED SHAMPOO

Sr.No	Tests	Herbal Shampoo			Marketed Shampoo
1	Formulations	F1	F2	F3	F1
2	Physical apperance	Dark brown	Dark brown	Dark brown	Light Blue
3	pH	5.51	5.58	5.62	6.8
4	%Solid content	21.11	22.05	24.02	28.01

- Test for washability : Easy to wash with water both in herbal shampoo and clinic plus.
- Test for Solubility: solubilty of shampoos in various solvents were done shown in below table:

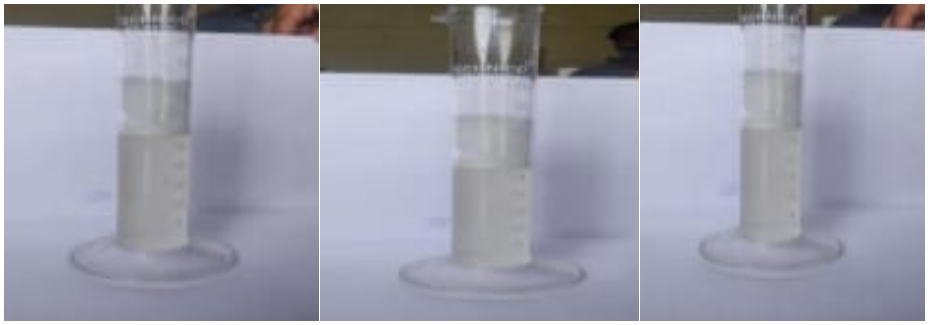
Sr .No	Sample	Solubility		
1	Herbal shampoo	Soluble in water	Soluble in warm water	Soluble in Ethanol
2	Marketed shampoo (clinic plus)	Soluble in water	Soluble in warm water	Soluble in Ethanol

- Loss on drying: After drying herbal shampoo was found to be 8.05%w/w and clinic plus 5.11%.
- Skin /eye irritation test: No reaction by using herbal shampoo as well as marketed product (clinic plus)



- Foaming ability and Forming Stability: The result showed that the herbal shampoo is capable of producing high forming property, and it is due to presence of suodium lauryl sulphate .

The forming ability is more in clinic plus as it contains both methylcellulose and SLS.



Sr.no	Formulation	Forming ability & forming stability(ml)
1	F1	30
2	F2	35
3	F3	39

- Surface Tension:The results of the rheological examination showed that the shampoo compositions were time-dependent, with the samples' viscosity gradually changing as rpm increases. The generated shampoo showed a surface tension drop of about 35.18 dynes/cm and the marketed showed 45.11dyne/cm. One of the mechanisms underlying the detergency feature is the reduction of surface tension, which will serve as a sign of the shampoo's effective detergency. This can be achieved by reducing the surface tension of water from 72.8 dynes/cm to 32–37 dynes/cm.
- Wetting time :It took around 10 sec the disc to submerge in the herbal shampoo mixture and it took 15sec to submerge in the marketed shampoo (clinic plus).
- Dirt dispersion: The dirt dispersion of herbal shampoo was done and it was found to be that the dispersion of the dirt in water is good for formulated shampoo because the result indicate that no dirt would stay in the form, so prepared formulation is satisfactory. Same where the results of clinic plus shampoo.

Sr.no	Formulation	Dirt dispersion (herbal shampoo)	Dirt dispersion (herbal shampoo)
1	F1	Moderate	Good
2	F2	Moderate	NA
3	F3	Good	NA

- Cleaning action:After washing with herbal shampoo applied 2ml approximately, it removed all the oil in one wash. Same with marketed shampoo. But the hairwash after drying results made difference the hairs washed with herbal shampoo wash soft, smooth , shiny &freez free but the hair washed with marketed shampoo (clinic plus)were rough and freezy.



Fig 1.Clinic plus and Fig 2. Herbal shampoo results

- Antimicrobial Activity: Herbal shampoo showed anti dandruff activity as well as inhibition against tested gram-positive and gram-negative bacterial strains as shown in Figure below. The marketed shampoo do not show any result. The diameter of zone of inhibition increased as the concentration of the herbal shampoo increased, showing a dose-dependent effect.

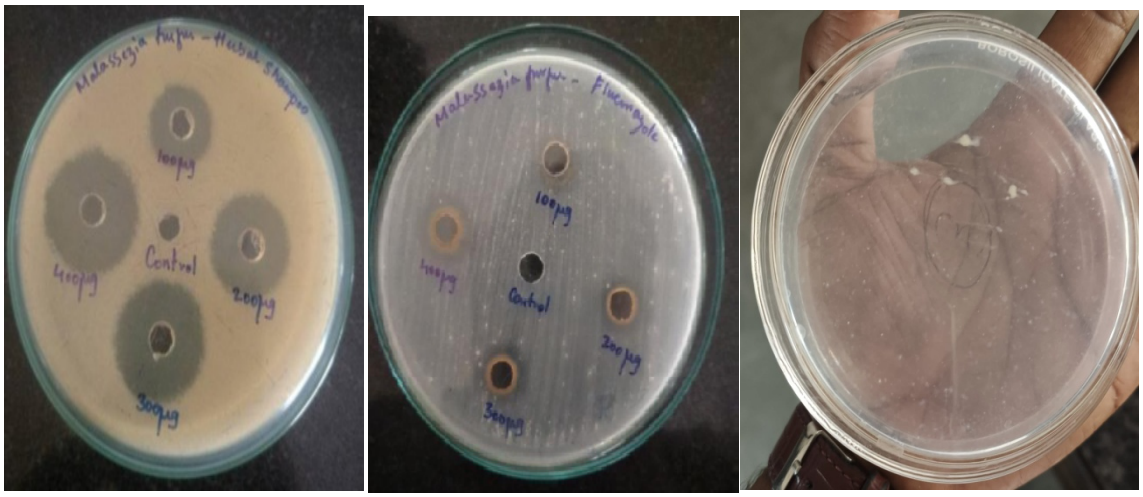


Figure 3. Anti-dandruff activity of herbal shampoo and (clinic plus) marketed shampoo,
Figure 4. Antimicrobial activity of herbal shampoo,
Figure 5. Antimicrobial activity of (clinic plus) marketed shampoo.

VI. DISCUSSION

Medicinal plants used in the formulation ofherbal shampoo were found as rich source of novel drugs. The various quality control parameters were checked to detect the difference between herbal and chemical shampoo. All comparative parameter gives favorable result. The result obtained on present study shows that the active ingredients of these when incorporated in herbal shampoo gives more stable products with good aesthetic appeal. The pH of the herbal shampoo has beenshown tobe importantfor improvingand enhancingthe qualitiesof hair, minimizing the irritation to the eyes and stabilizing the ecological balance of the scalp.

The current trend to promote shampoos of lower pH is one of the minimizing damage to the hair. Such results are estimated out of a formulation to establish strong results for the usage and good results of the product. The evaluationparameters like Organoleptic evaluation, General powder Characters, Physicochemical Evaluation, Cleaning action, foaming, Dirt dispersion, Wetting agent, Nature of hair, etc after wash was carried out and was found to be within the standard range.

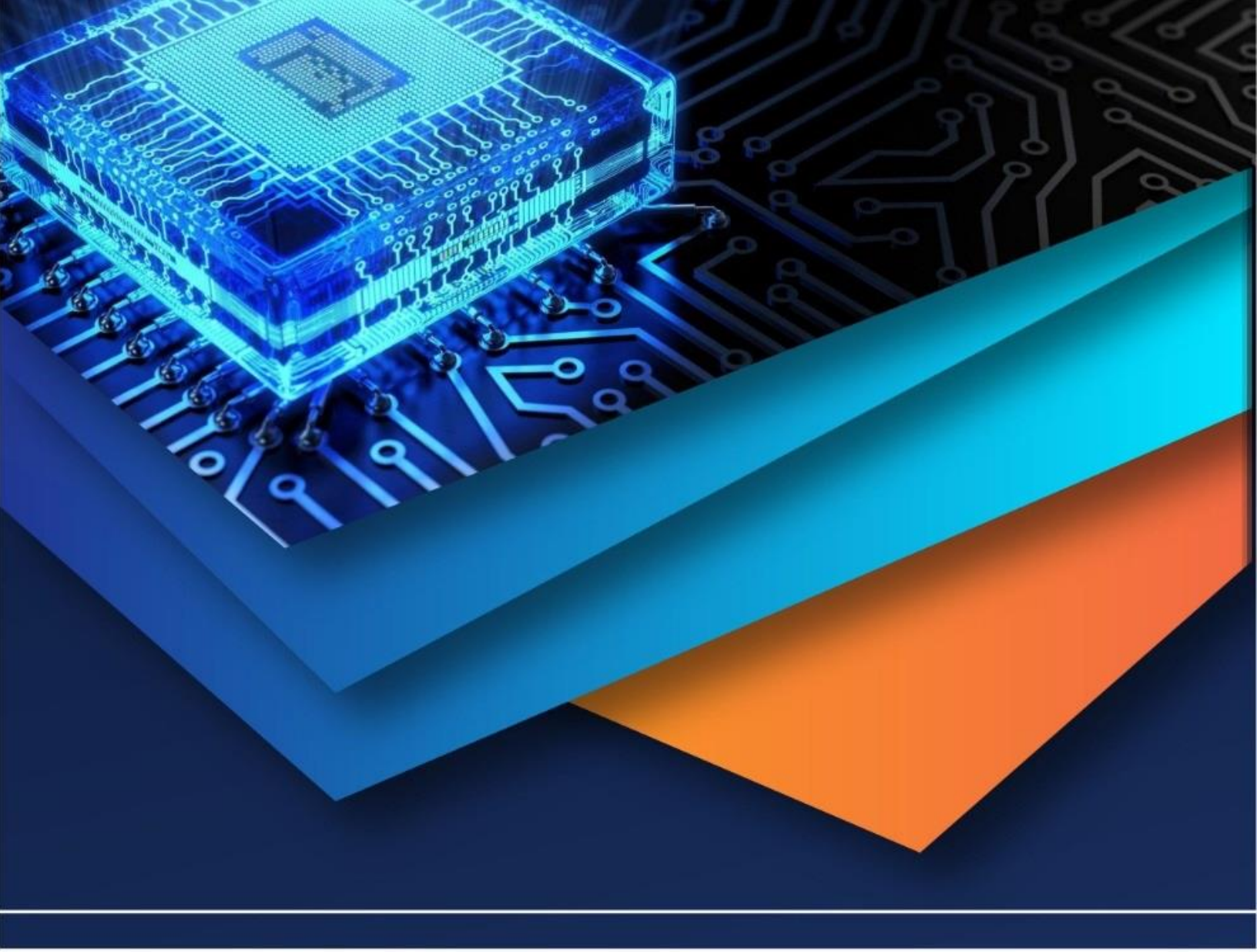
VII. CONCLUSION

Consumer use of herbal products has significantly expanded over the past several years, according to a review of worldwide hair care market trends. Present investigations was carried out to formulate the herbal shampoo preparations based upon traditional knowledge and to perform comparative study with chemical shampoo of market (clinic plus). Nowadays there is strong demand for natural therapies, and this is increasing in western countries. The herbs whichare acheapest ofphytoconstituents areon whealsto attaintheir role in polyherbal formulation so as to have synergistic role. Hence we conclude that the polyherbal Shampoo iseffective inreducing dandruff without irritation, less adverse effect and better conditioning effect compared to that with marketed product (Clinic plus). The awareness and need for cosmetics with herbs in on the rise, as it is strongly believed that these products are safe and free from side effects.

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