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RESEARCH ARTICLE

Formulation and Evaluation of Polyherbal Antiacne Face Wash for Management of Acne Vulgaris

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ABSTRACT

Acne is a chronic inflammatory condition of the skin causing spots, on the face, shoulders, back, neck, chest and upper arms. In this study various attempts are taken for the development and evaluation of the rose-water rose-acne gel from the *Matricaria recutita*, Eucalyptus globules, Walnut and *Achyranthas aspera* leaves, without using any synthetic ingredient. The Prepared formulations (F1 to F4) were evaluated for various parameters. Like colour, appearance, consistency, wash ability, pH, spreadability, grittiness, viscosity, homogeneity and extrudability. Amongst all the formulation studies shows that Walnut's containing gel was found optimum for the all parameter it was very good attempt to establish the herbal anti acne face wash gel contain rose water extract of herbal products.

INTRODUCTION

India's herbal medicine industry is thought to be the world's oldest medicinal system. The herbal history of ancient India is so old that the Vedas, a former religious work of the Indians, even referred to the ancient form of herbal healing [1]. Ayurveda and Unani, two ancient herbal medicine systems, deal with the use of herbs and natural products to treat health problems. While herbal medicines may seem to be novel to western healers and physicians, the truth is that plant extracts are still used in the majority of medicines today. Currently, countries all over the world value this ancient form of medicine, and Indian herbal medicines are in high demand, resulting in rapid growth and an annual growth rate of nearly 30% [2].

In recent years, there has been a huge rise in global demand for herbal remedies, herbal skin care products, and even herbal cosmetics. Since our skin is the most exposed part of our body to pathogens, it needs protection from skin diseases, especially bacteria that cause acne. Acne is the most common skin issue among today's adolescents, affecting 85% of them. They can last into adulthood and are most common in areas with the most oil glands, such as the face and neck. Seborrhea, inflammatory lesions, comedones, excessive sebum production, and the presence of bacteria such as *Propionibacterium* acnes, *Staphylococcus* epidermidis, and *Malassezia* furfur in the follicles are all characteristics of acne. As a result, these microorganisms may be targeted for acne treatment. Antibiotics used over long periods of time allow species to develop resistance to the drugs. This adaptation is multi-factorial and is affected by the organism's susceptibility to the treatment as well as host factors such as hormones and stress levels. To resolve this question, herbal treatment alternatives have been investigated. The herbal extracts were modulated and formulated as a poly herbal anti-acne face wash gel since they couldn't be used directly for treatment [3].

People, especially in rural areas, still prefer natural remedies (plant extracts) to conventional cosmetics. Cosmetics are skin-care items that purify and beautify the skin. These are active ingredients that appear to have medicinal and

drug-like properties. Face wash is a form of cleanser that cleans the face without drying it out. Face wash is often referred to as "cleanser." Face wash has been found to be ideal for all skin types. Face wash is very effective at removing dirt and oil while still moisturising dry skin. Face washes and cleansers are both used to remove dirt, oil, and pollution from your face. A cleanser is a product that removes excess dirt, makeup, and grime from your skin. There are impurities that are oil soluble. They can also be removed with a face wash, but this may not be completely successful [4].

Ordinary soaps can cause facial skin to lose moisture, which is delicate. A face wash is a gentle cleanser that keeps skin clean, germ-free, smooth, and fresh while also moisturising the horny layer without scratching the skin. As a result, the skin tends to be young and energetic. The aim of a face wash may be to provide cleaning, anti-wrinkle, anti-acne, moisturising, and skin fairness. Skin whitening agents are thought to influence the production and metabolism of melanin in the skin by inhibiting melanin production in melanocytes and thereby reducing the amount of melanin present. Because of their low toxicity to melanocytes, agents that inhibit melanin development, such as propanediol, Evodia rutaecarpa fruit extract, arbutin, kojic acid, vitamin C, and its derivatives, are used in whitening cosmetics [5].

Forms of Face Wash

1. Cream based face wash
2. Gel based face wash
3. Liquid based face wash
4. Face wash in powder form

Types of Face Wash

In general, a face wash is appropriate for all skin types, although various products are now available on the market that are formulated to suit different skin types. For example, an oily skin face wash is intended for people with oily skin conditions and does not contain oils, leaving a thin oily film on the skin. These are some of the numerous styles of face washes available on the market [6].

1. Oily skin face wash
2. Dry skin face wash
3. Normal skin face wash

Feature of Face Wash

1. Removing the dead cells.
2. Rejuvenating the skin cells.
3. Removes oil, dirt and impurities.
4. Reduces microbial flora of skin
5. Leave skin fresh and breathing.

Gel Based Face Wash Gel

A gel is a solid jelly-like substance with properties ranging from soft and pliable to tough and robust. Gels are a significantly dilute cross-linked device that does not flow in its steady-state state. Gels are mainly liquid by weight, but due to a three-dimensional cross-linked network within the liquid, they behave like solids. The structure (hardness) of a gel is defined by cross linking within the fluid, which also contributes to the adhesive stickiness (tack). Gels are a dispersion of liquid molecules inside a solid, with the solid serving as the continuous phase and the liquid acting as the discontinuous phase. Thomas Graham, a 19th-century Scottish chemist, invented the term gel by taking a word from gelatin [7].

Skin Whitening Herbs

The use of chemicals, mixtures, or physical procedures to lighten skin colour is known as skin whitening herbs. Skin whitening procedures operate by lowering the skin's melanin level. Many agents have been shown to be effective in skin whitening; some have health benefits (e.g. antioxidants, nutrients), while others pose a serious health risk (for example, those containing mercury).

Natural whitening agents like melanin biosynthesis or tyrosinase inhibitors that can modulate the metabolism of pigmentation for human colour provide an important, mostly unexplored area for production of new skin-care cosmetics such as natural whitening agents like melanin biosynthesis or tyrosinase inhibitors, which are able to modulate the metabolism of pigmentation for human colour. Skin and it play an important role in skin whiteness, while antioxidants that combat oxidative stress in skin ageing cells can help to maintain skin health. Melanin, which is formed by melanocyte cells in the epidermis' basal layer, may be overproduced as a consequence of prolonged sun exposure, melasma, or other hyperpigmentation diseases. As a result, whitening agents minimise melanin overproduction, which causes darkened age spots, while pigmenting agents, such as melanin, are engineered to enhance pigmentation for sun protection. However, avoiding ultraviolet (UV) exposure, inhibiting melanocyte metabolism and

proliferation by inhibiting tyrosinase activity, or removing melanin with corneal ablation have all been identified as ways to inhibit melanin biosynthesis [8].

Tyrosinase is a central enzyme in the anabolism of melanin biosynthesis in melanocytes, catalysing the first two steps of the pathway: hydroxylation of tyrosine (a monophenolic compound) to L-dopa (L-3,4-dihydroxyphenylalane; one of the o-diphenols) and oxidation of L-dopa to o-dopaquinone (one of o-quinones). In a sequence of non-enzymatic reactions, these o-quinones are converted into melanin. As a result, tyrosinase inhibitors are popular in cosmetics and skin whitening agents, and tyrosinase has emerged as a key target enzyme for screening and developing new inhibitors. This is why researchers are actively searching for tyrosinase inhibitors derived from natural plants or TCMs in the hopes of preventing melanin overproduction or hyperpigmentation disorders.

The highly reactive intermediate formed by dopa oxidation, as well as reactive oxygen species (ROS) and other free radicals induced by oxidative stress in skin cells or UV radiation exposure, have been shown to be improperly processed in enhancing melanin biosynthesis, damaging DNA, and most likely inducing melanocyte proliferation. Antioxidants are believed to minimise hyperpigmentation by scavenging free radicals or reactive oxygen species (ROS). Despite the fact that plant-derived anti-oxidants scavenge free radicals, their nature and concentration are thought to differ among plants. The DPPH free radical-scavenging assay is a simple and commonly used method for screening free radical-scavenging potential of compounds or antioxidant activity of plant extracts since 1,1-diphenyl-2 picryl hydrazyl (DPPH) is a stable radical [9, 10].

Uses of Ingredients

Many cosmetic and pharmaceutical firms are working on studies that will modify skin pigmentation as the emphasis on skin appearance increases. There are many known substances today that can help to reduce skin pigmentation. Many of these active ingredients inhibit tyrosinase, resulting in lower total melanin production. Kojic acid, arbutin, Evodia rutaecarpa, and various vegetal or herb extracts are examples of tyrosinase inhibitors used today. Niacinamide and soybean are two molecules that have been shown to influence the transition of melanin from melanocytes to keratinocytes, resulting in a lighter skin tone. To reduce excessive melanin content in the skin, substances that increase skin desquamation, such as retinoic acid, are widely used [11].

MATERIALS AND METHODS

Collection of Plant Materials

Matricaria recutita, Walnut's, Eucalyptus globules and Achyranthes aspera collected from thelocal area. Resin of guggul, Fruits of Nutmeg, sago, fruit of cucumber, leaves of tulasi, and fruit of lemon purchased from the local kirana store and local vegetable market (Jaggampeta) from the local market and rosewater (DABUR Gulabari premium rose water) were purchased from the local market.

Preparation of Herbal Extracts

Herbal Extracts can be prepared by maceration method by using rose water used as a solvent (1:5). *Matricaria recutita*, Walnut's, Eucalyptus globules and *Achyranthes aspera* leaves were dried in a hot air oven at 45°C and then ground into small pieces with a grinder. To make powder, nutmeg and guggul seeds were crushed. In a conical flask, desired amounts of herbal drug were measured, and each herb was macerated with rose water. Separately, dried herbs and rose water were allowed to mix for three days in a conical flask with mild shaking. The contents were filtered out after 3 days using a simple filtration process, and the filtrates were collected in separate vessels.

Filtration

Filtration of extract was done by using simple filter paper and funnel for two times [12].

Evaporation

The electronic water bath was used for evaporation. Filtrates were allowed to evaporate in an evaporating pan at 600°C until the desired extract concentration was obtained.

Development of Formulation

Table 1 shows the preparation of different formulation batches. The desired amount of gelling agent, sago gum, was accurately weighed and dispersed in hot rose water (not more than 60°C; 50% of the batch size) with mild stirring to avoid air entrapment, then allowed to soak overnight. By gently stirring, the desired amount of lemon juice was dissolved in the desired amount of honey.

The desired amount of concentrated herbal extracts was added to the remaining rose water and gently combined with the honey mixture above. Finally, this was combined with the previously soaked gel formulation. The prepared formulations were put in an appropriate container and labeled [13].

Table 1: List of ingredients used in formulation of poly herbal anti Acne face wash

Ingredients	F1	F2	F3	F4
Matricaria recutita	1gm	-	-	-
Walnut's leaf extract		1gm	-	-
Eucalyptus globulus	-	-	1gm	-
Achyranthes aspera	-	-	-	1gm
Sago gum	0.5%	0.5%	0.5%	0.5%
Tulsi	0.2 mL	0.2 mL	0.2 mL	0.2 mL
Honey	0.2 mL	0.2 mL	0.2 mL	0.2 mL
Sandalwood	0.2 mL	0.2 mL	0.2 mL	0.2 mL
Lemon juice	0.2 mL	0.2 mL	0.2 mL	0.2 mL
Guggul	0.2 mL	0.2 mL	0.2 mL	0.2 mL
Cucumber	0.2 mL	0.2 mL	0.2 mL	0.2 mL
Nutmeg	0.2 mL	0.2 mL	0.2 mL	0.2 mL
Rose water	Up to 10 mL	Up to 10 mL	Up to 10 mL	Up to 10 mL

Evaluation Tests

The prepared formulations evaluated for following tests and compared with marketed ayush herbal face wash (lever ayush anti pimple turmeric face wash).

Physical Appearance

The physical appearance of the formulation was checked visually which comprised.

***Colour*:**

The color of the formulations was checked out against white background.

***Odour*:**

The odour of the face washes were checked manually.

***Consistency*:**

The consistency was checked by applying on skin.

***Greasiness*:**

The greasiness was assessed by the application onto the skin.

***pH*:**

An amount of 20 mg of the formulation was taken in a beaker and was subjected to the pH measurement using a digital pH meter within 24 hrs of manufacture [14].

Washability:

Formulations were applied on the skin & then ease & extent of washing with water were checked manually.

Homogeneity:

Homogeneity was tested by visual inspection after allowing them to set in a container. They are evaluated for their appearance and presence of aggregates.

***Grittiness*:**

The formulations were evaluated microscopically under 40 x magnifications for the presence of any particulate matter or aggregates.

Viscosity:

Viscosities of formulated gels were determined using Brookfield viscometer spindle # 7 at 50 rpm and 25°C. The corresponding dial reading on the viscometer was noted. Then the spindle was lowered successively. The dial reading was multiplied by the factor mentioned in catalog.

Extrudability:

The weight in grams needed to extrude a 0.5 cm long ribbon of formulation in 10 seconds is known as extrudability. Filling regular capped collapsible aluminium tubes with gel formulation and crimping to the end sealed the tubes. The tubes were clamped in place between two slides.

The cap was removed after a 500 g weight was put over the slides. The length of the formulation ribbon that emerged in 10 seconds was recorded [15].

***Spreadability*:**

The degree to which a gel readily spreads on application to the skin or affected portion is referred to as spreadability. The gel's bioavailability efficiency is also influenced by the Spreadability value. Under a given load, spreadability is defined as the time it takes the upper slide to slip off the gel placed between the two slides in seconds. The higher the spreadability, the less time it takes to differentiate two slides. A total of 500 mg of the formulation was sandwiched between two slides, each measuring 6 cm x 2 cm. A 100 g weight was put on the upper slide to evenly press the formulation between the two slides and form a thin layer. The excess of the formulation adhering to the slides was scraped off, and the weight was removed. The lower slide was secured to the apparatus's board, while the upper slide was secured to a non-flexible string to which a 20g load was applied through a simple pulley that was horizontally aligned with the fixed slide. It was documented how long it took the upper slide to slip off the lower slide [16].

$$\text{Spreadability} = \frac{m \times l}{t}$$

Where,
m= Weight tied to upper slide
l= Length of the glass slide (6 cm)
t= Time in seconds.

Stability Studies:

The physical stability of the formulations was studied by placing in plastic containers and they were placed in a humidity chamber at 45°C and 75% relative humidity. Their appearance and physical stability were inspected per a period of 3 months at interval of one month [17-19].

RESULTS AND DISCUSSION

Organoleptic Parameters

The prepared acne face wash gel was evaluated for its appearance results are mentioned in Table 2.

Table 2: Results for organoleptic properties, consistency, greasiness, pH and washability of formulations

Formulation code	Odour	Colour	Consistency	Greasiness	pH	Washability
Marketed (Ayush herbal anti acne face wash)	Sandal	Cream colour	Semi solid	No	5.6	Good
F1-Matricaria recutita	Sandal	Cream colour	Semi solid	No	5.7	Good
F2-Walnut's leaf extract	Sandal	Cream colour	Semi solid	No	5.6	Good
F3-Eucalyptus globulus	Sandal	Light yellow colour	Semi solid	No	5.5	Good
F4-Achyranthes aspera	Sandal	Yellowish colour	Semi solid	No	5.7	Good

Consistency

The prepared formulations produce semisolid consistency. This was confirmed by visual observation. The results are shown in Table 2.

Greasiness

The prepared formulations are does not greasiness upon application on the skin. The results are shown in Table 2.

pH

The pH of formulation was found to be satisfactory and in the range of 5.6-5.7. It is near to the skin pH which indicates that the prepared formulation can be compatible with skin. The results are shown in Table 2.

Washability

Prepared formulations were easily washed with water. The results are shown in Table 2.

Homogeneity

Under visual inspection of the prepared formulation indicated no lumps and to have uniform color dispersion, free from any fiber and particle. The results are shown in Table 3.

Grittiness

The prepared formulation are shows no grittiness. The results are shown in Table 3.

Viscosity

Brookfield viscometer was used to measure the viscosity of gel. Viscosity of the formulations is

observed to be in the range of 4.762-5.629, which is shown in Table 3.

Extrudability

The prepared formulations show that good extrudability. The results are shown in Table 3.

Spreadability

The spreadability studies showed that all formulations have better spreadability when compared to marketed formulations and in the range of 8.34-10.67 (Table 3).

Table 3: Results for Homogeneity, Grittiness, Viscosity (poise), Extrudability and Spreadability of formulations

Formulation code	Homogeneity	Grittiness	Viscosity (poise)	Extrudability	Spreadability (gm-cm/sec)
Marketed (Ayush herbal anti acne face wash)	No aggregate	No	6.387	Good	10.67
F1-Matricaria recutita	No aggregate	No	4.762	Good	8.34
F2-Walnut's leaf extract	No aggregate	No	5.189	Good	9.29
F3-Eucalyptus globulus	No aggregate	No	4.943	Good	8.54
F4-Achyranthes aspera	No aggregate	No	5.629	Good	9.12

Table 4: Results for stability studies

Formulation code	F2-Walnut's leaf extract	F2-Walnut's leaf extract	F2-Walnut's leaf extract	F3-Eucalyptus globulus	F3-Eucalyptus globulus
	Initial	1st Month	2nd Month	3rd Month	4th Month
Colour	Cream colour	Cream colour	Cream colour	Cream colour	Cream colour
Odour	Sandal	sandal	sandal	sandal	sandal
pH	5.62	5.61	5.60	5.69	5.68
Spreadability (gm-cm/sec)	8.342	8.187	8.168	8.156	8.149
Viscosity(poise)	4.625	4.532	4.441	4.323	4.287

Stability Studies

During stability studies F2 formulation produces good results during 3 months and the results are shown in the Table 4.

CONCLUSION

Polyherbal medicines for health care, health, and cosmetics, such as face washes, gels, and anti-acne preparations, are also becoming more popular on the global market. According to an analysis of global skin care industry patterns, consumer use of herbal products has increased significantly in recent years. To evaluate the prepared formulations for the desired parameters, an attempt was made to formulate polyherbal anti acne face wash gel using different natural ingredients such as Matricaria recutita, Walnuts, Eucalyptus globules, and Achyranthes aspera. Formulations that have been prepared Physical properties such as colour, odour, grittiness, greasiness, pH, viscosity, consistency, spreadability, washability, and stability studies were evaluated. Walnut leaf extract gives formulations the desired gel strength. During stability checks, honey produces humectant behaviour. The spreadability of these preparations is outstanding. It denotes that it is simple to apply to the skin. F2 Walnut's leaf extract formulations produce desired characteristics as compared to marketed Ayush herbal anti acne face wash formulations. Based on the observations, we conclude that the herbal gel made with lotus and sago gum has more appropriate properties than the others.

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