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RESEARCH ARTICLE

Formulation and evaluation of anti-acne herbal gel

Susmitha Biyyala[1]*, Teja Nayudu[2]

[1]Department of Pharmacy, Sri Venkateshwar College of Pharmacy, Osmania University, Hyderabad, Telangana, India, [2]Department of Pharmaceutics, V.V. Institute of Pharmaceutical Sciences, Gudlavalleru, Andhra Pradesh, India

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ABSTRACT

Acne is basically the involvement of sebaceous gland which comprised pustules and papules means solid lesions occur on the skin or puss occurs on the skin. Ayurveda approaches acne from symptomatic and causative levels to remove symptoms, herbal and herbal preparations can be used. Simultaneously, the excess pitta and toxins inside the body should be reduced. Herbal formulation shares growing demand in the world market. It is very good attempt to establish the herbal face wash containing aqueous extracts of neem leaves, turmeric rhizomes, Aloevera, and green tea.

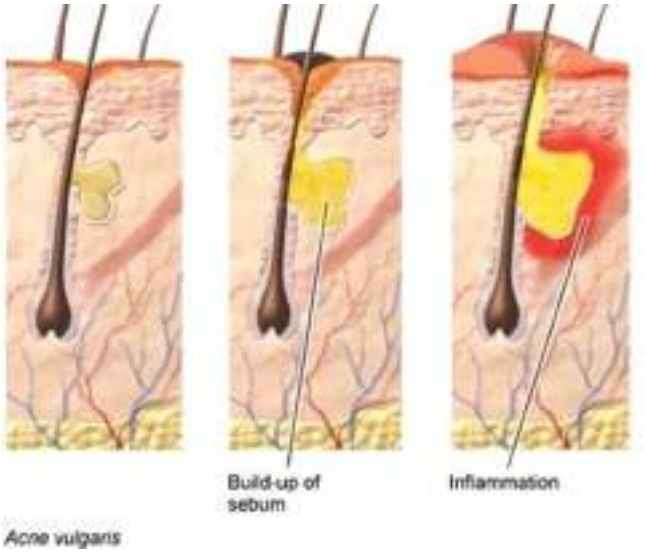
Keywords: Anti acne, herbal gel, Neem, Turmeric, Aloe vera, Ashwagandha

INTRODUCTION

Most teenagers will have pimples at some point some only have a few small pimples that soon go away. Others develop persistent and clearly visible acne. This can be very distressing, particularly in puberty. However, there are a number of things that can be done about acne. Although patience is needed, this is about acne in teenagers and younger known as “Common acne” or “Acne vulgaris.”

DEFINITION

Acne is also called as “Acne vulgaris” in medical terminology.[1] Acne is basically the involvement of sebaceous gland which comprised pustules and papules means solid lesions occur on the skin or puss occurs on the skin. Normally, this sebaceous gland protects and moistures the skin and is very important for the skin. However, due to certain changes such as extreme dirt, dust, or germs infections, it harms the skin.[2]



OCCURRENCE

Day-to-day exposure of human skin leads to number of problems such as acne, pimples, pigmentations, and sunburns marks.[3] Typically begins around puberty and early adolescence, it tends to present earlier in females 12 or 13 years then in males 14 or 15 years due to late onset of puberty in males. Acne has been estimated to affect 95–100% of 16–17-year-old boys and 83–85% of 16–17-year-old girls acne is a pleomorphic disease that occurs on the face 99%,

***Corresponding Author:**
Susmitha Biyyala
E-mail: sushmithavarma27@gmail.com

back 60%, and chest 15%. The individual lesions of acne vulgaris are divisible into three types; non-inflamed lesions, inflamed lesions, and scars.[4]

CAUSES OF ACNE

Infectious contribution

Microorganisms such as *Propionibacterium acnes* and *Staphylococcus aureus* are one of the causative agents for acne. They have ability to adapt the abnormal oil production, inflammation, and inadequate sloughing of acne pores. A parasites mite, Demodex, has been shown to be associated with the development of acne.

Dietary involvement

Acne vulgaris is seen to be associated with foods with having high glycemic index such as milk, salt, and chocolates. Studies have also shown the relation of obesity with acne.

Genetic contribution

In some peoples, the cause of acne could be genetic rate of acne which is seen among first degree relatives and in twins' studies as well. The genes, which attributed to acne, are polymorphisms in IL-1alpha, TNF-alpha, and CYP1A1.

Hormonal changes

Puberty menstrual cycles cause hormonal changes that contribute acne vulgaris. Androgen is the sex hormones that increases during puberty and pregnancy causes the more sebum production in follicular glands. Anabolic steroids can also lead to the development of acne vulgaris in adult women.

a. Increased sebum production
b. Hypercornification of the pilosebaceous ducts
c. Abnormal bacterial function (microbial invasion)
d. Production of inflammation

STAGES OF ACNE

Mild acne

If your break outs are few and fairly minor, you've got mild acne. You have some blackheads and bumpiness, and even an inflamed pimple here and there, but in general, your blemishes are not wide spread. Mild acne can occur across all ages and in all skin types.

Moderate acne

With moderate acne, breakouts will be more noticeable. You may still have bumpy skin and blackheads, but you'll also regularly get inflamed papules and pustules. These tend to pop up on the lower cheeks, chin, and jaw line, especially right before their periods.

Severe acne

The biggest difference between moderate and severe acne is inflammation. Your blemishes are large, red, and swollen.

DIFFERENT TYPES OF ACNE

Acne vulgaris

It is the medical name for common acne. The presence of blackheads, whiteheads, and other types of pimples

on the skin. The most common spots for breakouts are the face, chest, shoulders, and back. Although mild acne may improve with over-the-counter treatment, more severe forms should be treated.

Comedones

A comedones, or basic acne lesions, is a hair follicle that has become clogged with oil and dead skin cells, comedones can develop into bumps called "comedogenic." "Makeup labeled" "non-comedogenic" is less likely to clog pores and contribute to acne.

Blackheads

These are comedones that are open at the surface of the skin. They are filled with excess oil and dead skin cells. It is not dirt that causes the comedones to turn black. The blackheads result from the irregular reflection of light coming from clogged hair follicle. Blackheads can frequently be treated with over-the-counter medication.

Papules

These are comedones that become inflamed, forming, small red or pink bumps on the skin. This type of pimples may be sensitive to the touch. Picking or squeezing can make the inflammation worse and may lead to scarring. A large number of papules may indicate moderate to severe acne.

Whiteheads

Comedones that stay closed at the surface of the skin are called whiteheads. This happens when oil and skin cells prevent a clogged hair follicle from opening. Many of the same over-the-counter medicines that blackheads are also effective against whiteheads.

Pustules

These are another kind of inflamed pimples. They resemble whiteheads with a red ring around the bumps. The bumps are typically filled with white or yellow pus. Avoid picking or squeezing pustules. Picking can cause scars or dark spots to develop on the skin.

Nodules

These are large inflamed bumps that feel firm to touch. They develop deep within the skin and are often painful.

TREATMENT FOR ACNE

In modern science, the treatment of acne includes topical, systemic, and hormonal therapy. For decades, the drugs have been used for the treatment of acne and still a good choice for the allopathic treatment of acne. However, due to the number of side effects, these medicines are need to be replaced by herbal drugs.

The negligible adverse effects of herbal drugs compared with modern medicines have become another important aspect in the treatment of this condition. Acne can be cured by herbal either consuming internally and externally or with both.[5] Topical treatment is preferable choice of consumers as ease of application, safe, and efficacious for their efficacy in the treatment of acne but still many herbs are remained untouched by the scientist. The review focuses the benefits of herbal medicines for the treatment of acne.

VARIOUS SYSTEMS AN ROLE OF PLANTS IN THE TREATMENT OF ACNE

Ayurvedic perspective

According to Ayurveda, acne is generally excess of pitta. Therefore, Ayurveda approaches acne from symptomatic and causative levels to remove symptoms, herbal and herbal preparations can be used. Simultaneously, the excess pitta and toxins inside the body should be reduced.[6]

Some medicinal plants used in the treatment of acne

1. *Azadirachta indica* Linn.: (NEEM)
2. *Curcuma longa* Linn.: (TURMERIC)
3. *Withania somniferous* Linn.: (ASHWAGHANDHA)
4. *Aloe barbadensis* Mill: (*ALOE VERA*)
5. *Piper nigrum* Linn.: (BLACKPEPPER)
6. *Eucalyptus globulus* Labill: (EUCALYPTUS)
7. *Citrus aurantium* Linn.: (BITTERORANGE)
8. *Cocos nucifera* Linn.: (COCONUT)
9. *Carica papaya* Linn.: (PAPAYA)
10. *Berberis aquifolium* Pursh: OREGONGRAPE)

List of Allopathic drugs used in the treatment of acne

Acne treatment usually contains one of the following ingredients (some of which are only available on prescription):

Benzoyl peroxide, salicylic acid, resorcinol, azelaic acid, dapsone gel, retinoids and retinoid-like creams, gels, lotions, topical antibiotics, oral antibiotics, combined oral contraceptives, oral isotretinoin, spironolactone's, lasers and photodynamic therapy, and steroid injection.

PLANT PROFILE

A. indica (Plant profile)

Taxonomical classification:

Kingdom:	Plantae
Division:	Magnoliophyte
Class:	Magnoliopsida
Order:	Sapindales
Family:	Meliaceace
Genus:	Azadirachta
Species:	Azadirachta indica
Scientific name:	*Azadirachta indica*
Common name	Neem, Nimtree, Margosa

Leaves

The leaves are alternate, petiolated, clustered at the end of branches, unequally pinnate, glabrous and dark glossy green at maturity, 20–40 cm in length and bearing 10–20 leaflets. The leaflets are 510 cm long 1.2–4 cm broad, sickle shaped, and slightly denticulate.

Neem is a fast-growing tree of the mahogany family (Meliaceae) valued as a medicinal plant. Neem is likely native to the Indian subcontinent and to dry areas throughout South Asia.[7] It has been introduced to parts of Africa. The plant has long been used in Ayurvedic and folk medicine and id used in cosmetics and in organic farming applications.

Chemical constituents

A. indica L. (NEEM) shows therapeutic role in health management due to rich source of various types of ingredients. The most important active constituents is azadiracta and the others are nimbolinin, nimbin, nimbidin, nimbidol, sodium nimbinate, gedunin, salanin, and quercetin. Leaves contain ingredients such as nimbin, nimbanene, 6-desacetylnimbinene, nimbandiol, nimbolide, ascorbic acid, n-hexacosanol, amino acid 7-desacetyi-7-benzoylazadiradione,7-desacetyl-7-benzoylgedunin,17-hydroxyazadiradione, nimbiolquercetion, beta-sitostreol, and polyphenolic flavonoids, were purified from neem fresh leaves, and were known to have antibacterial and antifungal properties and seeds hold valuable constituents including gedunin and azadirachtin.

Temperature

It is a typical tropical to subtropical tree and exists at annual mean temperature of 21–32°C (7090 F). It can tolerate high to very high temperature and does not tolerate temperature below 4°C (39 F).

Azadirachtin is extracted from the neem tree (*A. indica* and *Azadirachta juss*) which is about 50 days at room temperature but rapid decomposition occurs at higher temperatures.

Soil conditions

Neem trees grow well in wide range of soils. However, black cotton soils are best for growing these trees. Neem can be grown in even in rocky soils where water availability is a major problem. Neem trees increase the soil fertility and help in neutralizing acidity in the soil. Neem trees thrives well in all regions having average annual rainfall of 350–1200 mm. Neem tree can tolerate high temperature even up to 50–52°C these trees cannot withstand intensive shade, frost, extreme cold, or freezing conditions.

Cultivation

Land or main filed should be ploughed couple of times to remove any weeds and required pits should be dug. Neem seedlings can be raised on nursery beds and transplanted to main field or they even can be sown directly in the field. Planting or transplanting neem trees before or during rainy season are the best for their establishment. For seed collection and planting, use fruits at the yellow-green color stage. Collected fruits should be depupled immediately. Germination of seeds depends on the storage. If the neem seeds are fresh, the chances of the germination would be about 90%. Soak the seeds in cold water for a day for better germination.[8] Germination of seeds starts after a week (6–7 days). Neem seedlings should be transplanted when they are 8–10 cm tall with a tap root of 15 cm long. Dry areas require more aged seedlings 25–30 cm height should be transplanted

(beginning of the rainy season) in pits of 30 cubic centimeters at a distance of 3 meter × 3 meter.

Harvesting of neem cultivation

Neem trees start bearing fruits after 4–5 years and come to full bearing at the age of 10–11 years.

Uses

Nearly all parts of the neem tree are useful, and many of its medicinal and cosmetic uses are based on its antibacterial and antifungal properties. Neem is commonly used in shampoos for treating dandruff and in soaps or creams for skin conditions such as acne.

This can lead breakouts and oily skin. The antibacterial properties of neem have a plosive impact on any pimples or black/whiteheads. The harmful effects of bacteria that cause these breakouts are nullified by the anti-inflammatory properties of neem.

It is also a component in some tooth pastes and mouth washes, especially in the Indian subcontinent, and young twigs are used directly as crude tooth brushes in rural areas. Neem leaves have long been used as a traditional treatment for diabetes and there is some clinical evidence, suggesting that it may help control blood sugar levels.

Turmeric (Plant profile)

Background of the study:

Taxonomical classification:

Kingdom: Plantae
Division: Leave sheath, Leaf blade
Class: Monocotyledon
Order: Zingiberales
Family: Zingiberaceae
Genus: Curcuma
Species: *C. longa*
Scientific name: *Curcuma longa*
Common name: Turmeric, Saffron Indian

The primary rhizomes are ovate or pear-shaped, oblong or pyriform or cylindrical and often short branched. The rhizomes are known as bulb or round. The secondary, more cylindrical, lateral branched, tapering on both ends, rhizomes are 4–7 cm long and 1–5.5 cm wide and called as

fingers. The bulbous and finger shaped parts are separated and the long fingers are broken in to convenient bits. They are freed from adhering dirt and fibrous roots and subjected to curing and polishing process. The curing consists of cooking the rhizomes along with few leaves in water until they become soft. The cooked rhizomes are cooled, dried in open air with intermittent turning over, and rubbed on a rough surface. Color is deep yellow to orange, with root scar and encircling ridge like ring or annulations, the latter from the scar of leaf base. Fracture is horny and the cut surface is waxy and resinous in appearance. Outer surface is deep yellow to brown and longitudinally wrinkled. Taste is aromatic, pungent and bitter, odor is distinct.[9]

Chemical constituents

Curcumin demethoxycurcumin, bisdemetho xycurcumin, eugenol, dihydrocurcumin, azulene, borneol, d-camphene, caorylicacid, cineol, and turmerone.

Climate

Turmeric can be grown from sea level to 1500 m in the hills, at a temperature range of 20–30°C with rainfall of 1500–2250 mm/annum. It is also grown as an irrigated crop.

Soil conditions

It thrives best in a well-drained sandy or clayey loam rich in humus content. It can be grown on different soil, namely, light black, ashy loam, and red soils to clay loams.

Cultivation planning

The areas where the rainfall is sufficiently early, crop can be planted during April–May with the receipt of pre-monsoon showers. Since turmeric is a shade loving plant, castor or *Sesbania grandiflora* may be raised along the border lines in the field. Well-developed healthy and disease free whole or split mother rhizomes weighing 35–44 g are used for planting. Rhizomes are treated with 0.3% Dithane M-45, 0.5% malathion for 3 min before storing. Small pits are made with a hand hole in the beds in rows with a spacing of 25 × 30 cm and covered with soil or dry powdered cattle manure, the optimum spacing in furrows and ridges about 45–60 cm can between the rows and 25 cm between the rows and 25 cm plants. A seed rate of 2500 kg of rhizomes are required for one health care.

Harvesting

Depending on the variety, the crop becomes ready for harvest in 7–9 months. The land is ploughed and the rhizomes are gathered by hand picking or the clumps are carefully lifted with a spade. Harvested rhizomes are cleaned of mud and others extraneous matter adhering to them. The average yield per hectare is 20–25 tones of green turmeric.

Uses

In addition to being a known an anti-inflammatory and antioxidant, turmeric also has documented antimicrobial, antibacterial, and anti-neoplastic (anticancer) properties.

Specifically turmeric activity ingredients the curcuminoids are able to effectively fight off the underlaying causes of skin inflammation which may range from oil build up to bacteria on the skins surface. Chronic acne causes skin scarring and also leaves the skin more vulnerable to damage from the elements, the sun and also viral, bacterial, fungal, and parasitic invasion. Using turmeric can help your still healing skin bolster its own defenses to resist future acne breakouts.

Temperature

The ideal temperature range for growing turmeric is between 68 and 95 F (20–35°C). When the temperature drop below 50 F (10°C), the plant suffers.

***Aloe vera* (Plant profile)**

Background of the study:

Taxonomical classification:

Kingdom: Plantae

Class: Monocotyledon

Order: Asparagales

Family: Asphodelaceae

Genus: *A. vera*

Species: *Aloe vera*

Scientific name: *Aloe vera, Aloe barbadensis*

Common name: True aloe, Indian Aloe

A. vera is a natural product that is nowadays frequently used in the field of cosmetology.

A. vera plant has been known and used for centuries for its health, beauty, medicinal, and skin care properties. The name *A. vera* derives from the Arabic word "alloeh" meaning "shining bitter substance," while "vera" in Latin means "true" 2000 years ago, the Greek scientist regarded immortality. Today, *A. vera* plant has been used for various purpose in dermatology.[10]

The botanical name of *A. vera* is *A. barbadensis* miller. It belongs to *Asphodelaceae* (Liliaceae) family and is a shrubby or arborescent, perennial, xerophytic, succulent, pea-green color plant. It grows mainly in the dry regions of Africa, Asia, Europe, and America. In India, it is found in Rajasthan, Andhra Pradesh, Gujarat, Maharashtra, and Tamil Nadu.

The plant has triangular, fleshy leaves with serrated edges, yellow tubular flowers and fruits that contain numerous seeds.

Each leaf is composed of three layers:

1. An inner clear gel that contains 99% water and rest is made of glucomannan, amino acids lipids, sterols, and vitamins.
2. The middle layers of latex which is the bitter yellow sap contains anthraquinones and glycosides.
3. The outer thick layer of 15–20 cells called as rind which has protective function and synthesize carbohydrates and proteins. Inside the rind are vascular bundles responsible for transportation of substances such as water (xylem) and starch (phloem).

Chemical constituents

Active components with its properties: *A. vera* contains 75 potentially active constituents: Vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids, and amino acids. Vitamins: It contains Vitamins A (beta-carotene), C, and E, which are antioxidants.

Temperature

E55 and 80°C.

Uses

There's a good reason that *A. vera* is used for so many skin problems – it has anti-inflammatory properties. That means that *A. vera* can help reduce swelling.

Putting *Aloe vera* on a red, swollen pimple can help reduce tenderness and pain. Aloe also has wound healing effects, so it may help open acne blemishes. If acne treatment is leaving your skin dry and irritated aloe gel, or a moisturizer containing aloe, can be especially helpful. Your skin will be more comfortable, so you will be less likely to ditch your acne medications.

A. vera may help fade post-inflammatory hyperpigmentation's, those dark acne marks left after pimples have healed. This is due to a constituent in *A. vera* called Aloin.

Ashwagandha (Plant profile)

Kingdom: Plantae
Order : Solanaceae
Family : Solanaceae
Genus : Withania
Species: *W. somnifera*
Scientific name: *Withania somnifera*
Common name: Indian ginseng, Poison gooseberry, Winter cherry.

Ashwagandha (*W. somnifera*, fam. Solanaceae) is commonly known as "Indian Winter cherry" or "Indian Ginseng." It is one of the most important herbs of Ayurveda (the traditional system of medicine in India) used for millennia as a Rasayana for its wide ranging health benefits. Rasayana is described as an herbal or metallic preparation that promotes a youthful state of physical and mental health and expand happiness. These types of remedies are given to small children as tonics and are also taken by the middle aged and elderly to increase longevity. Among the Ayurvedic Rasayana herbs, Ashwagandha holds the most prominent place. It is known as "Sattvic Kapha Rasayana" herb. Most of the Rasayana herbs are adaptogen/anti-stress agents.[11]

Ashwagandha is commonly available as a churna, a fine sieved powder that can be mixed with water, ghee (clarified butter), or honey. It enhances the function of the brain and nervous system and improves the memory. It improves the function of the reproductive system promoting a healthy sexual and reproductive balance. Being a powerful adaptogen, it enhances the body's resilience to stress. Ashwagandha improves the body's defense against disease by improving the cell-mediated immunity.[12] It also possesses potent antioxidant properties that help protect against cellular damage caused by free radicals.

Chemical constituents

The biologically active chemical constituents of *W. somnifera* include alkaloids (isopelletierine, anaferine, cuseohygrine, anahygrine, etc.), steroidal lactones (withanolides, withaferins), and saponins. Sitoindosides and acylsterylglucosides in Ashwagandha are anti-stress agents. Active principles of Ashwagandha, for instance, the sitoindosides VII-X and Withaferin A, have been shown to have significant anti-stress activity against acute models of experimental stress. Many of its constituents support immunomodulatory actions. The aerial parts of *W. somnifera* yielded 5-dehydroxy withanolide-R and withasomniferin-A.

Temperature

70–95 F (20–35°C).

Uses

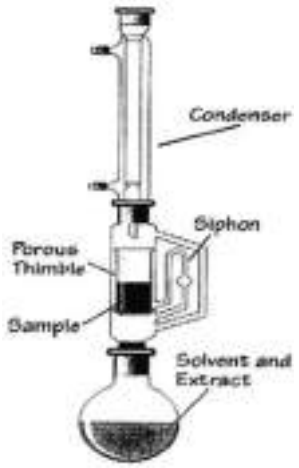
Ashwagandha contains chemicals that might help calm the brain, reduce, swelling, lower blood pressure, and alter the immune system. Since Ashwagandha is traditionally used as an adaptogen, it is used for many conditions related to stress. Adaptogen is believed to help the body resist physical and mental stress.

MATERIALS AND METHOD OF PREARATION

Soxhlet extraction is the process of continuous extraction in which the same solvent can be circulated through the extractor several times. The process involves extraction followed by evaporation of the solvent. The vapor of the solvent is taken to a condenser and the condensed liquid is returned to the drug for continuous extraction.

Soxhlet apparatus designed for such continuous extraction consist of the body of the extractor with a side tube and siphon tube as shown in the figure. The extractor from the lower side attached to distillation flask and the mouth of the extractor is fixed to a condenser by standard joints.

The crude drug powder is packed in the Soxhlet apparatus directly or in the thimble of the filter



paper or fine muslin. The diameter of the thimble corresponds to the internal diameter of the Soxhlet extractor.

Extraction assembly is the set up by fixing a condenser and a distillation flask. Initially for the setting of the powder, the solvent is allowed to pass through the siphon once before heating. Fresh activated porcelain pieces are added to flask to avoid bumping of the solvent. The vapors are pass through the side tube and the condensed liquid gradually increases the level of liquid in the extractor and the siphon tube.[13] A siphon is set up as the liquid reaches the point of return and the content of the extraction chamber is transferred to the flask. The cycle of the solvent evaporation and siphoning back can be continued as many times as possible without changing the solvent, so as to get efficient.

Similar methodology can be adopted in large-scale production in which the operation principle may resemble the laboratory equipment. The extraction can be continued until complete exhaustion of the drug. The main disadvantage is that this process is restricted to pure boiling solvents or to azeotropes.

DISTILLATION

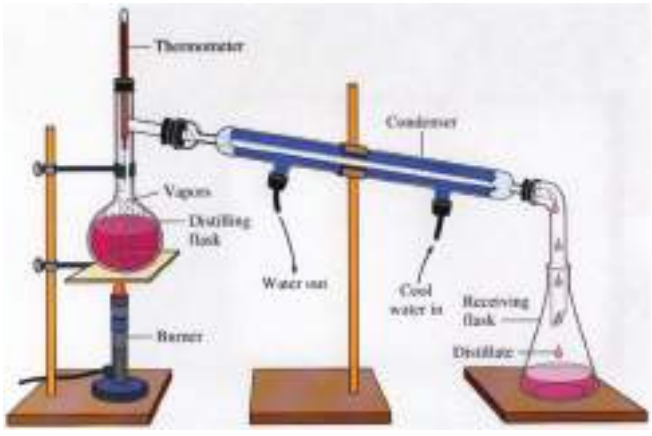
Distillation is a common operation in many laboratories for the purpose of separating and/or purifying components of a liquid mixture. The apparatus used consists of three major parts is distillation flask (or pot) to heat the mixture and volatilize the components, a condenser to cool the vapors back to liquid state, and a collection vessel.

The apparatus is usually made of glass and therefore subject to breakage. All components of the distillation apparatus should be secured to a stable stand or rack to prevent it from falling over. All the glassware, particularly the part to be heated, should be checked for cracks before use.

Connections between the glass parts may involve rubber or cork stoppers but in more modern apparatus, standard taper connections are used.[14] If stoppers are used, it must be known that the hot vapors will not react with the rubber or cork and thus contaminate the products. If standard taper connections are used, any lubricant used to make tight seals must also not react, melt or evaporate, and contaminate the product.

The condenser must generally be connected to a source of running water to provide cooling for the vapors. The proper method is to connect the input hose to the condenser at the end furthest from the heated flask and the outflow hose nearest the heated flask. This prevents the hottest vapors from contacting the coldest water and creating a large thermal shock to the glassware. As mentioned in the section on flowing water, the hoses must be connected tightly enough to the condenser that they will not come loose if the water pressure should increase during the experiment. Usually, this means that something like copper wire is twisted around the tubing at the joint to prevent it from coming away. The flow of water must be sufficient to accomplish condensation without being so fast as to cause undue hose pressure or splashing of outflow water, remembering that flow rates can change during the day after they have initially been set.[15]

The distillation flask should preferably be a round-bottomed one rather than a flat-bottomed one for smoothness of boiling. The flask should never be more than half-filled with the liquid mixture to be distilled. Greater filling leads to bubbles and sometimes foaming that is constricted in the narrowing part of the flask and gets out of control.



To make boiling smoothest, boiling chips or tubes should be added to the liquid in the distillation flask before heating has begun. It is very important not to add chips or tubes to heated liquid as it may suddenly begin to boil and eject hot liquid out onto the operator. The chips are generally made of sharp pieces of broken ceramic or hard plastic. Tubes are usually of the capillary type with both ends open.

Heating the distillation flask requires care. The liquids being distilled are often flammable so that flame is not the preferred heat source. Heating mantles or sand baths are good sources of heat to conform to the round-bottomed flasks. Care must be taken not to let any vapors near the control switches that may spark when opening and closing. Doing the distillation inside a hood is a good practice, where one last word of caution about the apparatus is in order. There have been cases the operators decided to make the connection between the condenser and the receiving vessel a tight one using a stopper or standard taper connection. This must NOT be done as it creates a completely sealed system. When the distillation flask is heated and vapors begin to rise they will expand and create a pressure in such a sealed system that will inevitably blow the joints apart. This generally causes vapors to escape into the surrounding room (or hopefully hood) if not the glassware to be broken. Always allow for a pressure relief opening in the distillation system between the condenser and the receiving vessel. Note in the diagram above the glass connector where the drops are falling is NOT sealed but is only loosely in the receiving flask.

MATERIALS AND METHODS

A. indica

Collection of plant material

The plant of *A. indica* leaves is collected from the medicinal garden.

Drying of plant leaves

1. First, take a few fresh neem leaves and wash them in clean water to remove dirt.
2. Then strain the leaves of any water and lay them on a flat plate or pan.
3. Now, place the leaves in a shaded area for 3 days until all the moisture from the leaves gets dried out becoming dry and crispy. (Don't sundry the leaves because it can reduce nutrient content).
4. Next, break the dried leaves into smaller pieces using your hands.
5. Then put the pieces into a grinder or food processor and grind into a fine powder.
6. Use a sieve to remove large particles of the ground leaves.
7. Finally, place the neem powder in an air tight container and store in a clean, dry area. Extraction process

The dried powdered plant leaves of *A. indica* extracted with ethanol using Soxhlet method. After extraction, the collected ethanolic extract was subjected to distillation to obtain the pure drug of extract. Finally, place the neem powder in an airtight.

Turmeric

Collection of plant material

1. The roots of *C. longa* are collected from the fields/local market.
2. Cut the turmeric roots into thin equal slices or use a vegetable peeler and "peel" the slices. The thinner the piece, the quicker the drying process.

Drying process

1. The dried powdered roots of *C. longa* were extracted with ethanol using Soxhlet extraction method. After exhaustive extraction the collected ethanolic extract were subjected to distillation to obtain the pure drug of extract.
2. Clean and peel the turmeric root.
3. Arrange the slices on a baking tray lined with baking paper (or on a dehydrator tray if using a dehydrator).
4. The pieces can touch but make sure they don't overlap. Bake in the oven at 100°C for about 2 h. Check on the dryness in about 1.5 h – depending on the thickness and water content, as well as your oven, the turmeric might need less or more time.
5. If using a dehydrator, dehydrate the turmeric at 40°C for about 4–5 h.
6. You could also dry them in a well-ventilated spot but this could take up to 14 days depending on where you live and the humidity of your area and in your house.
7. The turmeric is ready when it's crunchy dry.
8. The dried slices will also have shrunk in size. To check if they are completely dry, you can snap a piece in half. If it's bendy rather than a clean snap, then it's not ready yet.
9. Once you are done baking/dehydrating the turmeric, add the slices to a food processor.
10. Grinder and grind them to a fine powder.
11. Sift the powder through a sieve to collect bigger chunks, which will need to be ground again. Store in an airtight glass container in a dark, dry place. The properly dried powdered turmeric can be stored.

Extraction process

The dried powdered roots of *C. longa* were extracted with ethanol using Soxhlet extraction method. After exhaustive extraction, the collected ethanolic extract was subjected to distillation to obtain the pure drug of extract.

Ashwagandha

Collection of plant

Ashwagandha powder was collected from the local market.

Extraction procedure

In a conical flask, 20 g of Ashwagandha powder was added in a 50 ml of ethanol and then kept aside for 24 h. After 24 h, the product was filtered and then filtered product undergoes distillation.

METHOD OF PREPARATION OF GEL CONTAINING EXTRACT

One gram of Carbopol 940 was dispersed in 50 ml of distilled water kept the beaker a side to swell the Carbopol 940 to form gel. Take 5 ml of distilled water and required quantity of methylparaben and propylparaben were dissolved by heating on water bath solution was cooled and propylene glycol 400 and sodium lauryl sulfate added. Further required quantity of extract was mixed to the above mixture and add this solution into the Carbopol 940 gel with continuous stirring and add triethanolamine was added dropwise to the formulation for adjustment of required skin pH and to obtain the gel at required consistency.[15]

FORMULATION

As per method decribed below the formula were mentioned in Table 2. Gel was prepared by addition of 1 g and 2 g of extract to prepared 1% and 2% formulation, respectively.

RESULTS AND DISCUSSION

The result of evaluation are displayed in Table 3. Formulation was yellowish-green in color whereas marketed formulation was black in color formulation F1, F2 was found to have semisolid consistency. All formulations were found homogenous easily washable. All the formulations have slightly alkaline pH which was compatible with skin physiology.

EVALUATION PARAMETERS

Physical evaluation

Physical parameters such as color and consistency were checked manually [Table 1].

Table 1: Method of Preparation of gel

S. No.	Chemicals	Uses
1.	Carbopol 940	Gelling agent
2.	Methyl paraben	Preservative
3.	Propyl paraben	Preservative
4.	Propylene glycol 400	Solubility
5.	Triethanolamine	Neutralizer
6.	Sodium lauryl sulfate	Surfactant
7.	Charcoal	Absorbing agent

Table 2: Formulation of anti acne gel

S. No.	Ingredient name	Formulation
1	Extract	1 g
2	Carbopol 940	1 g
3	Methylparaben	0.2 g
4	Propyl paraben	0.1 g
5	Triethanolamine	1.2 ml
6	Propylene glycol 400	5 ml
7	Sodium lauryl sulfate	5 ml

Table 3: Comparing evaluation parameters of marketed product with f1 and f2 formulation

Formulation batch	Color	Consistency	Washability	pH	Extrude ability	Spreadability	Sign marks
Marketed	Black	Semisolid	Easily Washable	6.15	Good	Good	No
1	Yellowish-green	Semisolid	Easily washable	6.15	Good	Good	No
2	Yellowish-green	Semisolid	Easily washable	6.15	Good	Good	No

Washability

The product was applied on hand which was observed under running water.

pH

pH of 1% aqueous solution of the formulation was measured using a calibrated digital pH meter at constant temperature.

Spread ability

A 500 mg of the cream was sandwiched between two slides. A weight of 100 g was placed on upper slide. The weight was removed and extra formulation was scrapped off. The lower slide was fixed on board of apparatus and upper slide was fixed with non-flexible string on which 20 g load was applied. Time taken by upper slide to slip off was noted down.

Extrudability

The gel formulation was filled in standard capped collapsible aluminum tubes and sealed by crimping to the end. The weight of tubes was recorded and the tubes were placed between two glass slides and were clamped. A 500 g was placed over the slides and then the cap was removed. The amount of extruded gel was collected and weighed. The percent of extruded gel calculated as (1) when it is greater than 90%, then extrudability is excellent. (2) When it is greater than 80%, then extrudability is good. (3) When it is 70%, then extrudability is fair.[8] F. Irritancy test: The cream was applied on the left hand dorsal side surface of 1 sq. cm and observed in equal intervals up to 24 h for irritancy, redness, and edema.

Antibiotic

A gel containing natural extract of neem, turmeric, aswagandha, and *Aloe vera* has been found to be more effective in reducing mild-to-moderate acne then a gel containing the synthetic antibiotic.

CONCLUSION

Herbal formulation shares growing demand in the world market. It is very good attempt to establish the herbal face wash containing aqueous extracts of neem leaves, turmeric rhizomes, *A. vera*, and green tea. The plants have been reported in literature having good antimicrobial, anti-inflammatory, refreshing

activity, cleansing agent, dirt absorbent, and antioxidant formulation which are prepared using varied concentration of extract prepared formulation (F1 and F2) where evaluated for various parameters such as color, appearance, consistency, washability, pH and spreadability, extrudability, and skin irritation and compared with marketed formulation.

After evaluation study shows that both formulations gives good affect as marketed formulation and neither shows any side effect or skin irritation.

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