



Formulation And Evaluation of Herbal Toner by Using Leaves of Azadirachta Indica: A Review

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Abstract: In comparison to chemical medicines, natural therapies are more effective, safer, and have less side effects. On the global market, natural component formulations are becoming more and more prevalent. Herbal face toner enhances facial beauty and has no unfavourable effects. Azadirachta indica, liquid paraffin, peppermint, rose water, Tween-80, and lemon grass are the key components of herbal face toner. This herbal toner is used as a liquid on the skin. When their physical traits and organoleptic qualities were evaluated, the results were positive. Rehydrating skin, balancing skin pH, tightening pores, reducing irritation, and keeping skin germ-free are the goals of this herbal toner. It has the power to improve appearance while also reducing face irritation. It is useful in our hectic daily lives. The formulation showed no redness, edoema, inflammation, or irritation during irritancy experiments. So, in the current inquiry, we identified the advantageous properties of the face toner.

Keywords: Toner, Azadirachta indica, Herbal, Leaves

1. Introduction

Nature has consistently served as a shining example of the remarkable phenomena of symbiosis. All of nature's biotic and abiotic components are interrelated. As long as humans have existed, herbal remedies have a long history. The ancient writings, some of which date back thousands of years, showed that plants were utilised as medicines in China, India, Egypt, and Greece far before the Christian era. The human being appears to be afflicted disease than any other animal species. In the past, all most all the medicine used were from the plants, the plat beings man's only chemist for ages.

Hippocrates (400-370 BC) is regarded as the Father of Medicine. Hippocrates, a greek Philosopher and Physician, believed only in the fact superstition ruled society of that period. He applied logic and reason to medicine workable.

Medicinal plants are of the great value in the field of treatment and cure of disease. Over the years, scientific research has expanded our knowledge of the chemical effect and composition of the active constituent which determine the medicinal properties of the plants. It has now been a universally accepted fact that the plant drugs remedies are far safer than synthetic medicine for curing the complex disease. The modern development in instrumental technique of analysis and chromatographical methodologies have added numerous complex and rare natural product to the armory of phytomedicine.

Regardless of the underlying philosophical basis, the use of plants in virtually every major system of medicine serves as an illustration of the universal function that plants play in the treatment of sickness. Recorded information there is a great wealth of knowledge concerning the medicinal, narcotic and other properties of plants that is still transmitted orally from generation to generation by tribal societies, particularly those of

tropical Africa, North and South America and pacific countries.

Medicinal plants as a whole appear to occupy a stable place in modern medicine; changes in respect of individual plants may be expected with the progress of scientific research. Industry is interested in synthesizing natural substances in order to combat supply shortage or reduce cost in comparison with the extraction of the active constituents from natural raw material. Certain Products, natural or synthetic, may be found to be more effective in certain other application than those currently in use and the latter may, therefore, be abandoned. It is expected that medicine plants and their derivatives would continue to play a major role in medicinal therapy.

Biological activities as reported through studies on experimental animals, helminthes, microbe including bacteria, fungi, viruses and infecting parasites. Beside systemic pharmacology, where ever required, effect on experimental disease models. Most of the pharmacological action reported are a crude extract or active fractions. In general, the traditional and Ayurvedic uses of the plants are so wide and varied that it was not possible to correlate the pharmacological action with uses of the plants.

1.1 History of Herbal Medicine

Long before recorded history, plants were being used as medicine. As early as 3,000 BC, descriptions of plant medicines can be found in Chinese and Egyptian papyrus literature. Ayurveda, Siddha, Unani, and TCM are ancient medicinal systems that use herbal remedies. Indigenous societies (such as African and Native American) have long used plants in healing rituals. Western nations have dramatically boosted their use of botanicals and other plant-based medicines in recent years. Our medical practises were mostly controlled by plant-based medications about 200 years ago. However, when more dependable synthetic medications were widely accessible in the West, the usage of plants as medicine experienced a sharp fall. TCM and Unani medicine are practised in the Middle East and South Asia. On the other hand, many emerging nations still benefited from the extensive medical herbalism expertise. For instance, a sizable portion of people still use Siddha & Ayurveda medicines in India, Kambo Medicine in Japan, traditional Chinese medicine (TCM), and Unani remedies in the Middle East and South Asia.

1.2 Herbal Medicine

Approximately 80% of the world's population uses herbal medicines for primary healthcare, particularly in underdeveloped nations. They have endured because of their reliability, effectiveness, cultural acceptance, and less adverse effects. For age-related illnesses including memory loss, osteoporosis, osteoarthritis, diabetes, immunological and liver disorders, etc., for which contemporary treatment is either nonexistent or only palliative care is accessible, herbal remedies are also mentioned in ancient literature. They are thought to work better with the human body because they include chemical components that are essential to the physiological processes of live flora. More than 1.5 million people use the traditional medical system, which uses medicinal herbs for therapeutic, preventative, and promotional purposes. Medical practitioners from many systems of medicine as well as scientific communities from numerous fields have shown an interest in medicinal plants, which are a viable source of herbal formulations.⁶ Due to the toxicity and side effects of allopathic medications, the usage of herbal drugs has caused a sharp rise in the number of herbal drug makers. Herbal medications have been more and more popular among non-prescription users over the past few decades. These medications have withstood extensive human testing over many centuries and in the real world. Due to their toxicity, certain medications have been put on hold, while others have been changed or mixed.

1.2.1 Advantages of Herbal Drugs

- ✓ High low/minimum cost
- ✓ Complete accessibility
- ✓ Enhanced tolerance
- ✓ More protection
- ✓ Fewer side-effects
- ✓ Potency and efficiency is very high.

1.2.2 Disadvantages of Herbal Drugs

- ✓ Not able to cure rapid sickness and accidents
- ✓ Risk with self-dosing
- ✓ Complexity in standardizations

1.2.3 Role of Herbals in Modern Human Era

Many of the currently available to physicians have a long history of use as herbal remedies. The who estimate that 80 percent of the world's population presently use herbal medicine for some aspect of primary health care .in fact ,according to the world health organization ,approximately 25% of modern drugs used in the united states have been derived from plants.Among the 120 active compounds currently isolated from the higher plants and widely used in modern medicine today, 80 percent shows a positive correlation between their modern therapeutic use and the traditional use of the plants from which they are derived⁸.

- a) More than two thirds of the world's plant species –at least 35,000 of which are estimated to have medicinal value –come from the developing countries.
- b) At least 7,000 medicinal compounds in the modern pharmacopoeia are derived.

1.2.4 The Challenges in Herbal Medicines

A key challenge is to objectively assess conflicting toxicological, epidemiological, and other data and the verification of herbal materials used. The following key issues remain.

- ✓ Management within ranges of risk
- ✓ Communication of uncertainty
- ✓ Pharmacological, toxicological, and clinical documentation
- ✓ Pharmacovigilance
- ✓ Understanding why addition of harmful additives works
- ✓ evaluating “drug” interactions
- ✓ Constraints with clinical trials and people available
- ✓ Standardization
- ✓ Safety, and efficacy assessment

1.2.5 The Evaluation of New Herbal Products Consists of Six Steps

1. Characteristics of new substances
2. History and pattern of use
3. Any adverse reaction
4. Biological action
5. Toxicity
6. Clinical trial data

1.2.6 The Constraints in Herbal Medicines

Constraints associated with the handling of medicinal plants.

- ✓ Indiscriminate harvesting and poor post-harvest treatment practices.
- ✓ Lack of research on the development of high-yielding varieties, domestication etc.
- ✓ Poor agriculture and propagation methods.
- ✓ Inefficient processing techniques leading to low yields and poor quality products.
- ✓ Poor quality control procedures.
- ✓ Lack of current good manufacturing practices.
- ✓ Lack of R & D on product and process development.
- ✓ Difficulties in marketing.
- ✓ Lack of trained personnel and equipment.

- ✓ Lack of facilities to fabricate equipment locally.
- ✓ In addition, the processing of herbs, such as heating or boiling, may alter the dissolution rate, or even the pharmacological activity of the organic constituents.
- ✓ Similarly, a host of environmental factors, including soil, altitude, seasonal variation in temperature, atmospheric humidity, length of daylight, rainfall pattern, shade, dew, and frost conditions, may affect the levels of components in any given batch of an herb.
- ✓ Other factors, including infections, insects, planting density, competition with other plant species, seeding time, and genetic factors, play an important role.
- ✓ Plant collection for the use in botanicals is one of the factors of concern for quality. Plants collected in the wild may include non-targeted species, especially either by accidental substitution or intentional adulteration.
- ✓ Adulteration of herbal products can be made in various ways; commonly, adulteration is made by substituting other easily available or cheap plant species or sometimes by spiking of a product with synthetic constituents.

1.2.7 Factors Affecting Quality & Purity of Herbal Medicines:

1.2.7.1 Drug Adulteration

Adulteration may be defined as mixing or substituting the original drug material with other spurious, inferior, defective, spoiled, useless other parts of same or different plant or harmful substances or drug which do not confirm with the official standards.

Adulteration may take place by two ways

- Direct or intentional
- Indirect or unintentional

Examples for Adulteration

- a) With artificially manufactured materials, e.g. nutmeg is adulterated with basswood prepared to the required shape and size, the colored paraffin wax is used in place of beeswax.
- b) With inferior quality materials, e.g. Belladonna leaves are substituted with Ailanthus leaves, papaya seeds to adulterate Piper nigrum.
- c) With harmful / fictitious substances drugs, e.g. Pieces of amber colored glass in colophony, limestone in asafetida, lead shot in opium, white oil in coconut oil, cocoa butter with stearin or paraffin.

1.3 Herbal Toner

The phrase "herbal cosmetics" describes goods created using phyto-chemicals derived from various botanical sources that influence skin functions and provide nutrients necessary for both a healthy body and skin. Natural herbs, products, and extracts are known as herbal cosmetics and are used in cosmetic preparations for their aromatic properties. A type of skincare product known as a herbal toner is made from natural ingredients like herbs, flowers, and other plant extracts. After cleansing, it is applied to help remove any dirt or impurities that may still be on the skin and to get the skin ready for other skincare products, such as moisturiser. Herbal toners are beneficial for all skin types, but those with sensitive or dry skin should give them special consideration because they can lessen sensitivity and provide additional moisture. They can also be used as a mid-afternoon pick-me-up to moisturise and refresh the skin. This herbal toner's goals include rehydrating skin, balancing skin pH, tightening pores, reducing irritation, and keeping skin germ-free.

1.3.1 Toner



Figure No. 1.1 Picturisation of the formulation

Toner is a skin care product that's applied to the face and neck after scrubbing. It is used to remove any trace of dirt and dead skin cells after scrubbing. Additionally, it aids in skin smoothing and preparation for new skin care products like moisturisers and serums. The reason that glycolic acid is most frequently employed is that it is easily made by mixing sodium hydroxide with chloroacetic acid, followed by re-acidification.

1.3.2 Effects of a Toner on Skin

After thoroughly cleansing the face, skin toner was previously a popular product used to remove any remaining makeup or to remove additional sebum produced by the facial skin in order to prepare the skin for nourishing treatments. Toners can be separated into alcohol- and non-based versions for various skin types, such as oily skin, sensitive skin, or combination skin. Skin toners are being used increasingly commonly as cosmeceuticals products with a variety of benefits, such as antiseptics, rehydrating skin, balancing skin pH, tightening skin pores, and balancing irritation.

1.3.3 Information of toner

Skin toner, also known as just toner, is a lotion or wash used mostly on the face to cleanse the skin and minimise the appearance of pores. Additionally, it hydrates, protects, and revitalises the skin.

Toners can be used in a variety of ways on the skin:

- On a cotton round. (This is the most frequently used method.)
- Spraying onto the face.
- By applying a tonic gauze facial mask—a piece of gauze is covered with toner and left on the face for a few minute

1.3.4 Types of Toners:

1. **Skin fresheners or bracers:** It is a mild kind of toner. a toner that contains glycerin (a humectant) and water. The skin's surface is moisturised by humectant. The most common example of it is rosewater. It works best for skin types that are typical, dehydrated, and sensitive.
2. **Skin tonics:** Skin tonics are typically stronger and contain water, a humectant component, and a small amount of alcohol (up to 20%). Orange blossom water is a fantastic illustration of a skin tonic. It is okay to use skin tonics on oily skin.

3. **Acid toner:** These are a powerful type of toner that frequently includes alpha hydroxy acid and/or beta hydroxy acid. The most often utilised alpha hydroxy acids for exfoliating the skin's surface are glycolic, lactic, and mandelic acids. The most often used beta hydroxy acid is salicylic acid, which is effective for exfoliating the skin's deeper layers.
4. **Astringents:** The strongest type of toner is an astringent, which contains a lot of alcohol (20–60%), water, antibacterial compounds, and a humectant. These can harm and irritate the skin since they employ a lot of alcohol, which can eliminate the skin's extra protective lipids.

1.3.5 Advantages of Skin Toner

1. The pH of the skin must be balanced in order to maintain healthy skin.
2. Tightening pores: Herbal toners are helpful in pore-tightening.
3. It reduces the visibility of blackheads and acne.
4. It hydrates the skin can leave the skin looking smooth and moisturized.
5. Soothing the skin: Ingredients like chamomile and aloe vera, which have soothing characteristics and may soothe irritated or inflamed skin, are frequently found in herbal toners.
6. Refreshing the skin: Herbal toners can provide the skin a restoring and energizing experience, making it feel refreshed and energized.
7. Remove impurities: Herbal toners are helpful in clearing the skin of any leftover impurities, such as oil and grime, which can cause breakouts and other skin problems.
8. Enhancing absorption: Before using other skincare products, using a herbal toner can assist to improve their absorption and increase their effectiveness.

1.3.6 Disadvantages of skin toner:

1. The skin becomes dry and flaky when using toners that include alcohol.
2. Excessive use could irritate the skin. that is, edoema and redness.

1.3.7 Evaluation of Herbal Toner

1. **pH:** The 25 mL formulation was put in a beaker with graduations, the pH metre was calibrated, and the measurement was obtained after a length of time.
2. **Surface tension:** The stalagmometer received the formulation, and the surface tension was measured.
3. **Temperature variation:** To test the stability, the formulation was subjected to two distinct temperatures for three months: 45° C and -10° C.
4. **Light exposure testing:** To check for product discolouration, the product is left in its actual packaging in a light chamber or under direct sunlight for 48 hours.
5. **Skin irritation:** A small amount of the toner was sprayed on the dorsum of the left hand and left there for a while; the results showed that the skin was not irritated.
6. **Stickiness:** It was discovered that the particles were not particularly sticky.
7. **Skin conditioning:** After spraying the toner over the skin, it appeared to be moisturised, supple, and smooth.
8. **Spreadability:** The toner was sprayed onto the hand and spread effortlessly with cotton and a smooth cloth.
9. **Removal:** The face toner is easily removable.

1.4 Azadirachta indica

Through the improvement of antioxidant activity, suppression of bacterial growth, and modification of genetic pathways, plant products or natural products demonstrate an essential role in the prevention and treatment of diseases. Due to their low side effects and accessible qualities, several plants are still being eagerly explored for their potential medicinal roles in the management of diseases. It is common knowledge that allopathic medications cost a lot of money and have detrimental effects on healthy tissues and a variety of biological processes. The fact that many pharmacologically effective medications are made from natural resources, including medicinal plants, is well acknowledged. The Bible and the Quran are just two examples of religious texts that promote the use of herbs for treatment and prevention. Many infectious, metabolic, or cancerous disorders are treated using neem components in Ayurveda, Unani, homoeopathy, and modern medicine. In many nations, different preparations based on plants or their components are widely used to treat ailments. Neem

(*Azadirachta indica*), a plant typically found in India, Pakistan, Bangladesh, and Nepal and a member of the Meliaceae family, is discussed here in terms of its therapeutic implications for the treatment of numerous ailments. *Azadirachta indica* contains a variety of different elements, including as nimbin, nimbidin, nimbolide, and limonoids. These kinds of chemicals are useful for managing disorders by altering various genetic pathways and other processes. The first polyphenolic flavonoids to be isolated from neem leaves were quercetin and β -sitosterol, which were also recognised to have antifungal and antibacterial properties. There have been reports of numerous biological and pharmaceutical effects, such as antibacterial, antifungal, and anti-inflammatory ones. The anti-inflammatory, antiarthritic, antipyretic, hypoglycemic, antigastric ulcer, antifungal, antibacterial, and antitumor actions of neem have been proven by earlier researchers, and a review summarised the numerous therapeutic roles of neem.

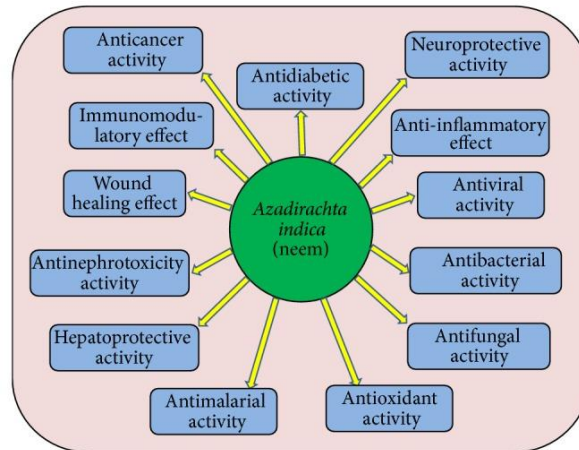


Figure No. 1.2 Properties of *Azadirachta indica*

1.4.1 Levaes of *Azadirachta indica*



Figure No. 1.3 Levaes of *Azadirachta indica*

Levaes primarily produce nimbosterol (β -sitosterol), quercetin (a flavonoid), and a variety of limonoids (nimbin and its derivatives). It is well known that the polyphenolic flavonoid quercetin has antimicrobial and antifungal effects. This could possibly explain why leaves have healing powers for wounds and scabies. At doses between 100 and 500 ppm, limonoids like nimocinolide and isonimocinolide have an impact on the fertility of house flies (*Musca domestica*). In mosquitoes (*Aedes aegypti*) creating intermediates, they also exhibit mutagenic qualities. An aromatic, viscous essential oil is produced by young, mature leaves, and it has antifungal properties when tested in vitro on fungus (*Trichophyton mentagrophytes*). The laticidal activity of white crystalline flakes made from a petroleum ether extract of leaves that contained a mixture of C 14, C 24, and C 31 alkanes was found to be greater than or equivalent to that of pyrethrum extract. The contents of neem leaves include protein (7.1%), carbohydrates (22.9%), minerals like calcium and phosphorus, vitamin C, and carotene, among others. However, they also contain fatty acids (dodecanoic, tetradecanoic, elcosanic, etc.), glutamic acid, tyrosine, aspartic acid, alanine, praline, glutamine and cystine-like amino acids, as well as other compounds.

1.5 Extraction

By utilising specific solvents and using established extraction techniques, extraction involves separating the medicinally active sections of plant or animal tissues from the inactive or inert components.

According to the extraction principle, there are several extraction procedures, including solvent extraction, distillation, pressing, and sublimation. The technique with the highest usage is solvent extraction. The extraction of natural products progresses through the following stages:

1. The solvent penetrates into the solid matrix;
2. The solute dissolves in the solvents;
3. The solute is diffused out of the solid matrix;
4. The extracted solutes are collected.

Efficiency of extraction depends upon following factors:

1. The properties of the extraction solvent,
2. The particle size of the raw materials,
3. The solvent-to-solid ration,
4. The extraction temperature &
5. The extraction duration

1.5.1 Steps Involved in the Extraction of Medicinal Plants

In order to extract medicinal ingredients from plant material, the following sequential steps are involved-

1. Size reduction
2. Extraction
3. Filtration
4. Concentration
5. Drying

1.5.2 Solvent/Menstruum Used in Extraction Process

Table No. 1.1 Difference between water and alcohol

1. Water	2. Alcohol
1. It is polar solvent and is used in the extraction of a wide range of polar compounds.	1. It is also polar in nature, miscible with water, and could extract polar secondary metabolites.
2. Solvent for protein, coloring matter, gums, glycoside, sugar, and alkaloid salts, enzymes and many organic acid and salts.	2. Solvent for alkaloids, alkaloids salt, glycoside, volatile oils and resins.
3. Wax, fat, fixed oil and most alkyl halides are insoluble in water.	3. Also dissolve coloring matter, tannis and organic acids and salts
4. it is cheap, nontoxic, nonflammable, and highly	4. Does not dissolve albuminous matters, gums, wax, fat, fixed oil

	and sugar
5. Disadvantage: -Wide solvent action-dissolve a wide range of substances that are undesirable	5. Disadvantage: it is costly & flammable and volatile

Other solvents used for extraction

3. Chloroform

- Nonpolar solvent
- Useful in the extraction of compounds such as terpenoids, flavonoids, fats, and oils.

Advantages-

1. Colorless, sweet smell, and is soluble in alcohols.
2. Also absorbed and metabolized in the body

Disadvantages-

1. Sedative and carcinogenic property.

4. Ether

- Nonpolar solvent
- Useful in the extraction of compounds such as alkaloids, terpenoids, coumarins, and fatty acids.
-

Advantages

1. Miscible with water.
2. Has low boiling point.
3. Tasteless in nature.

Disadvantages

1. Highly volatile and flammable in nature

5. Ionic liquid (Green Solvent)

- It is highly polar and extremely heat stable (remain in a liquid state even at 3,000).
- It is Miscibility with water and other solvent.

Advantages-

1. Excellent solvent that attracts and transmit microwave
2. It is nonflammable

1.5.3 Various Type of Methods Of Extraction

1. Infusion Method Decoction
2. Maceration
3. Percolation
4. Digestion
5. Counter-Current Extraction
6. Ultrasound Extraction (Sonication)
7. Supercritical Fluid Extraction
8. Hydrodistillation

1.6 Preliminary Phytochemical Screening

Preliminary phytochemical evaluation is the step after extraction in order to identify different class of constituents that can be present in extract that is carbohydrates, protein, lipids, flavonoids, tannins, glycosides, alkaloids or essential oils. Always choose a solvent of extraction by solubility and polarity of constituents that to obtained polar component use polar solvents only. After detecting the particular class, one can perform specific chemical test for whole crude drug or individual constituent to confirm any known drug or component.

1.6.1. Types of metabolites

The metabolites can be grouped into two major types:

- A. Primary
- B. Secondary.

Primary metabolites are those that are directly involved in the growth, development, and reproduction of an organism whereas secondary metabolites are those that are not Secondary metabolites are responsible for pharmacological activities

Table no. 1.2 Difference between Primary Metabolite & Secondary Metabolite

Basis for Comparison	Primary Metabolites	Secondary Metabolites
Definition	Primary metabolites are the compounds that are directly involved in the metabolic pathways of an organism necessary for its growth, development, and reproduction.	Secondary metabolites are the organic compounds that are produced by various organisms that are not directly involved in the growth, development, or reproduction of the organism but are essential in the ecological and other activities.
Also termed	Primary metabolites are also termed as central metabolites.	Secondary metabolites are also termed as specialized metabolites.
Growth phase	Primary metabolites are produced during the growth phase of the organism.	Secondary metabolites are produced during the stationary phase of the organism.
Growth phase	This phase of growth is also termed as 'trophophase'.	This phase of growth is also termed as 'idiophase'.
Quantity	Primary metabolites are produced in large quantities.	Secondary metabolites are produced in small quantities.
Extraction	It is easier to extract primary metabolites.	It is difficult to extract secondary metabolites.
Specificity	Primary metabolites are not species-specific and thus might be identical in some organisms.	Secondary metabolites are species-specific and thus are different in different organisms.
Involved in	Primary metabolites are involved in the growth, development, and reproduction	Secondary metabolites are involved in ecological functions and species interactions.

	of organisms.	
Structural component	Primary metabolites might form the molecular structure in organisms.	Secondary metabolites are not a part of the molecular structure of the organism
Importance	Primary metabolites are used in various industries for different purposes.	Secondary metabolites are used in various biotechnological procedures for the formation of drugs and other compounds.
Defensive action	Primary metabolites are not active in the defense mechanism.	Secondary metabolites are active against foreign invaders and might be involved as a defense mechanism.
Examples	Examples of primary metabolites include proteins, enzymes, carbohydrates, lipids, vitamins, ethanol, lactic acid, butanol, etc.	Some examples of secondary metabolites include steroids, essential oils, phenolics, alkaloids, pigments, antibiotics, etc.

General test for preliminary phytochemical screening:

- a) **Carbohydrates:**
Molisch's test, Iodine test, Fehling test, Benedicts test, Barfoed's test and Osazone test.
- b) **Protein:**
Biuret test, Million test, Xanthoprotein test, Precipitation test and Lead acetate test.
- c) **Amino acid:**
Ninhydrin test, Tyrosine test and Tryptophan test.
- d) **Alkaloids:**
Dragendorff's reagent, Modified Dragendorff's reagent, Hager's reagent, Mayer's reagent and Wagner's reagent.
- e) **Cardiac glycoside:**
Kedde test, Baljet test, Keller-killani test and Legal test.
- f) **Flavonoids:**
Shinoda test, Lead acetate test and Alkali test.
- g) **Tannins:**
Ferric chloride test, Gelatin salt test, Lead acetate test and Goldbeater's skin test.
- h) **Anthraquinones:**
Borntranger's test and Modified Borntranger's test.
- i) **Cyanogenetic glycoside:**
Sodium picrate test and Mercurous nitrate test.
- j) **Coumarin glycosides:**
Odour test, Alkali test and Fluorescence test.
- k) **Steroid or triterpenoids:**
Liebermann test and Liebermann-burchard test.
- l) **Saponins:**
Foam test and Hemolytic test.
- m) **Mucilage:**
Ruthenium red test and Swelling test.
- n) **Essential oil:**
Sudan Red III test.

1.7 Human Skin

The human body's largest organ is the skin. It is a striking and important organ. It has hair, nerves, glands, and nails on a fleshy surface. There are hair follicles in it, which hold hair strands to the skin.

It serves as a partition between the inside and exterior environments.

The thickness and texture of the skin vary. For instance, the skin around the eyes is as thin as paper, while the palm and foot soles are thick.

On the surface of our bodies, the skin takes up an area of 20 square feet.

It shields us from the outdoors, controls body temperature by sweating out water, and lets us to experience touch, heat, and cold sensations. It also protects the muscles, bones, and other vital organs of our body.

1.7.1. Structure of Skin

The skin, which has a total surface area of around 1.8 square metres, is the biggest organ in the human body. The skin's job is to shield our bodies from microorganisms and the elements. The victims of the mediaeval torture of being skinned alive demonstrated that the skin is also responsible for regulating our body temperature. After the victim's skin was removed, hypothermia would set in within hours, leading to the victim's death from freezing. The fact that the skin has a vast number of touch receptors and nerve endings makes it one of the most painful ways to pass away.

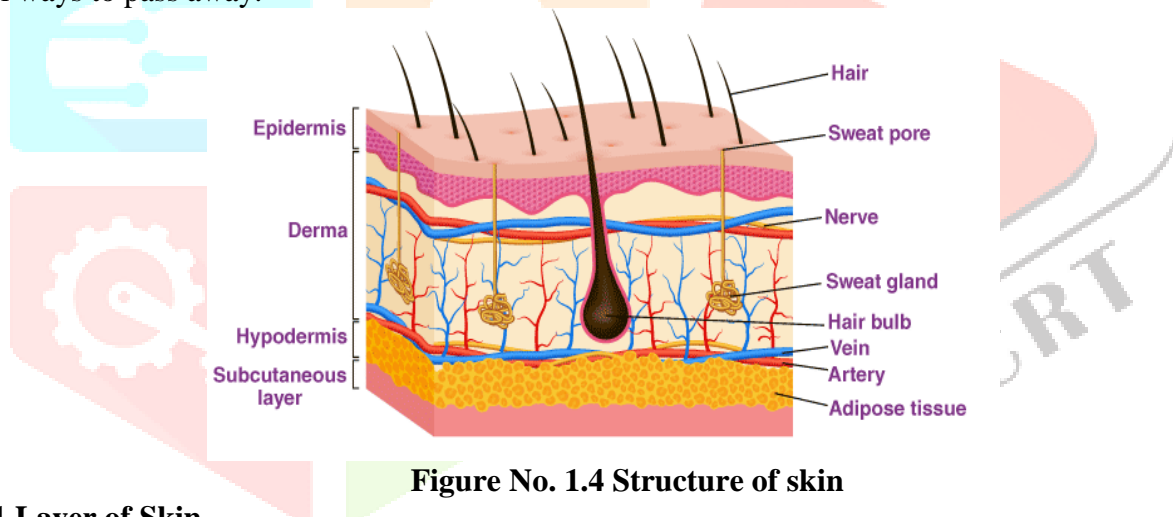


Figure No. 1.4 Structure of skin

1.7.1.1 Layer of Skin

It serves as the body's initial barrier against dangerous substances or foreign particles from the outside and offers a protective layer throughout the entire body. A protein called keratin makes up hair, and it is also present in other animals' hooves, horns, claws, and nails. The structure of the skin is made up of three layers of, namely:

- A. Epidermis
- B. Dermis
- C. Hypodermis

A. Epidermis

It is the skin's outermost layer. Keratinocytes are the name of the cells found in this layer. Keratin is a protein that makes up the keratinocytes. The skin is strengthened and rendered impermeable by keratin.

This layer also contains melanocytes, which make melanin. The skin also contains Langerhans cells, a component of the immune system, and Merkel cells, which are crucial for light touch feeling.

The following layers comprise the epidermis:

- Stratum corneum
- Stratum lucideum
- Stratum granulosum
- Stratum spinosum
- Stratum basale

Types of Epidermal Cells

There are three main cell types in the epidermis:

- a. **Melanocytes** – These cells are located in the basal cell layer and produce a pigment called melanin which is absorbed by the new cells to protect against harmful sun rays. The two factors that govern the melanin quantity in one's body is – genes and amount of exposure to sunlight.
- b. **Keratinocytes** – They are the main cells which are produced in the basal layer and approach towards the outermost layer.
- c. **Langerhans** – These cells are specialized to protect the body against foreign particles and hence is part of the immune system.

The epidermis and the dermis layer are connected through a dermo-epidermal junction and contain the basement membrane.

B. Dermis

- Beneath the epidermis is the dermis layer.
- It consists of papillae which form finger-like projections.
- This layer constitutes of fat, fibres and collagen which makes the skin flexible and strong. Dermis synthesizes Vitamin D to absorb calcium on exposure to sunlight.
- It consists of blood vessels which supply blood for the formation of new cells.
- They are also vital in regulating body temperature. Nerves in the dermis are sensitive to environmental factors such as pressure and temperature. Also, it contains the hair follicles and sebaceous oil gland which produces sebum.
- It acts as a lubricant and protects the skin by acting against the microbes.
- Sweat glands are produced all over the skin and release sweat through specialized ducts. They help the body to eliminate salts and minerals such as urea.
- An arrector pili muscle is attached to each hair follicle. This helps in the erection of hair when we experience cold or strong emotions.

C. Hypodermis

- This subcutaneous layer is made up of fat and forms the innermost layer.
- Its thickness is dependant on the region where they appear and vary. For example, the area around the eye is comparatively thinner for the easy movement of the eye.
- Fat stored provides energy and is crucial in reacting to ambient temperature. It insulates the body from heat and cold. It cushions the internal organs, muscles and bones, and protects them from any injuries

1.7.2 Function of Skin

Following are a few important function of the skin in the human body:

a) Protection from the Environment

This is foremost and the most important function of the skin. It keeps the pathogens away so that they do not enter into the skin and cause any harm.

b) Prevents Water Loss

Humans possess thick skin that loses less water. In deserts, the human skin gets thicker to prevent water loss to dry air.

Organisms with thin skin have the possibility of losing water all the time and need to stay near water to prevent it from drying.

c) Sensation

Skin is the main sense organ that can sense touch, heat, pressure, cold, pain, and pleasure. A network of nerves transmits these signals to the brain. Thus we can respond appropriately to a particular stimulus.

d) Regulation of Temperature

Our skin loses water through perspiration and cools itself, thereby, removing heat from the body. It also allows the hot blood to move to the surface of the skin, where its heat is radiated out of the skin. The phenomenon of “goosebumps” is also a temperature regulation response.

e) Camouflage

Many animals exhibit the phenomenon of camouflage where their skin produces colours and patterns that blend in with the surroundings and protects them from predators. Also, it makes it easier for predators to catch their prey by making themselves invisible in the surroundings.

The skin of chameleons can release different amounts of pigments at their own will.

f) Storage

The skin can store fats and water in its tissues. These provide extra insulation to our body.

The animals found in colder regions develop thick layers of fat to prevent themselves from the outside cold.

g) Excreting Scent Signals

The sweat secreted by our skin can also act as a signal to other organisms. Many animals mark their territories by secreting some scent from the glands in their skin which contains information about its age, health, gender, and availability to the mate.

1.7.3 Skin disorders

a) Acne

- Acne is commonly located Trusted Source on the face, neck, shoulders, chest, and upper back.
- Breakouts on the skin are composed of redness, blackheads, whiteheads, pimples, or deep, painful cysts and nodules.

b) Cold sore

- This condition causes a red, painful, fluid-filled blister that appears near the mouth and lips. People with lighter skin may notice more redness than those with darker skin.
- The affected area will often tingle or burn before the sore is visible.

c) Blister

- Blisters are characterized by a watery, clear, fluid-filled area on the skin.
- They may be smaller than 1 centimeter (cm) (vesicle) or larger than 1 cm (bulla) and can occur alone or in groups.

d) Hives

- This causes itchy, raised welts that occur after exposure to an allergen.
- Welts may be warm and mildly painful to the touch.
- Hives on darker skin can appear raised or inflamed and might be slightly darker or lighter than your natural skin color. On lighter skin, hives usually appear red.

e) Actinic keratosis

- This condition causes a thick, scaly, or crusty skin patch.
- It often appears on parts of the body that receive a lot of sun exposure, such as the hands, arms, face, scalp, and neck.
- The skin patch is usually pink in color but can have a brown, tan, or gray base. This patch may appear the same color as the surrounding skin in people with darker skin.

f) Rosacea

- This chronic skin disease goes through cycles of fading and relapse.
- Relapses may be triggered by spicy foods, alcoholic beverages, sunlight, stress, and the intestinal bacteria *Helicobacter pylori*.
- People with darker skin tones may notice brown discoloration or dry and swollen patches of dark skin.

g) Carbuncle

- This causes a red, painful, and irritated lump under your skin.
- It may be accompanied Trusted Source by fever, body aches, and fatigue.

h) Latex allergy

- This causes a rash, which may occur within minutes to hours after exposure to a latex product. It may be less visible on darker skin or appear lighter or darker than surrounding tissue.
- It also causes warm, itchy wheals at the site of contact, which may take on a dry, crusted appearance with repeated exposure to latex.

i) Eczema

- Eczema is characterized by yellow or white scaly patches that flake off.
- Affected areas may be itchy, greasy, or oily.
- On light skin, eczema can cause a red rash. This rash may appear brown, purple, or gray on darker skin.

j) Psoriasis

- This causes scaly, silvery, sharply defined skin patches. Darker skinned people might also experience dark brown or purplish patches on the skin.

k) Cellulitis

- Cellulitis is caused by bacteria or fungi entering Trusted Source through a crack or cut in the skin.
- It causes painful swollen skin with or without oozing that spreads quickly
-

l) Measles

- Symptoms of measles include fever, sore throat, red or watery eyes, loss of appetite, cough, and runny nose.
- It also causes a red rash, which spreads from the face down the body 3 to 5 days Trusted Source after the first symptoms appear. This rash might be more difficult to see on darker skin.

m) Basal cell carcinoma

- This condition is often characterized by raised, firm, and pale areas that may resemble Trusted Source a scar.
- It can cause dome-like, pink or red, shiny, and pearly areas that may have a sunk-in center, like a

crater. For people with dark skin, it might appear darker and less pearly.

n) Squamous cell carcinoma

- This condition often occurs Trusted Source in areas exposed to ultraviolet (UV) radiation, such as the face, ears, and back of the hands.
- It may be characterized by a scaly, reddish patch of skin, which progresses to a raised bump that continues to grow. The bump may be lighter on darker skin.

o) Melanoma

- This is the most serious Trusted Source form of skin cancer, which is more common in people with light skin.
- It can appear anywhere on the body as a mole that has irregularly shaped edges, asymmetrical shapes, and multiple colors. In People of Color, melanoma often appears in areas that are less exposed to the sun.

p) Lupus

- Lupus symptoms include Trusted Source fatigue, headaches, fever, and swollen or painful joints.
- It can cause a scaly, disc-shaped rash that doesn't itch or hurt.

q) Contact dermatitis

- This condition appears hours to days after contact with an allergen.
- It causes a rash with visible borders and appears where your skin touched the irritating substance.

r) Vitiligo

- Vitiligo is characterized by loss of pigment in the skin due to Trusted Source autoimmune destruction of the cells that give skin its color.
- Focal vitiligo causes loss of skin color in only a few small areas, which may merge together.

s) Wart

- Warts are caused by many different types of a virus called the human papillomavirus (HPV).
- They may be found on the skin or mucous membranes and can occur singly or in groups.

t) Chickenpox

- This can cause Trusted Source clusters of itchy, red or brown, fluid-filled blisters in various stages of healing all over the body.
- The rash is accompanied by fever, body aches, sore throat, and loss of appetite.

u) Seborrheic eczema

- This condition is characterized by Trusted Source yellow or white scaly patches that flake off.
- Affected areas may be red, itchy, greasy, or oily.

v) Keratosis pilaris

- This common skin condition is most often seen on the arms and legs but might also occur on the face, buttocks, and trunk.

w) Ringworm

- This condition causes Trusted Source circular, scaly rashes with a raised border.
- Skin in the middle of the ring might appear clear and healthy, and the ring's edges may spread outward.

x) Melasma

- This common skin condition causes dark patches to appear on the face and — rarely — the neck, chest, or arms.
- Melasma is more common in pregnant people (chloasma) and individuals with a darker skin color or heavy sun exposure.

y) **Impetigo**

- This condition is common Trusted Source in babies and children.
- It usually causes an irritating rash, which is often located in the area around the mouth, chin, and nose.

1.7.4 Symptoms of skin disorders

Skin conditions have a wide range of symptoms. Raised bumps that are red or white

- ✓ a rash, which might be painful or itchy
- ✓ scaly or rough skin
- ✓ peeling skin
- ✓ ulcers
- ✓ open sores or lesions
- ✓ dry, cracked skin
- ✓ discolored patches of skin
- ✓ fleshy bumps, warts, or other skin growths
- ✓ changes in mole color or size
- ✓ a loss of skin pigment
- ✓ excessive flushing

1.7.5 Causes of skin disorders

Common known causes of skin disorders include Trusted Source:

- ✓ bacteria trapped in skin pores and hair follicles
- ✓ fungus, parasites, or microorganisms living on the skin
- ✓ viruses
- ✓ a weakened immune system
- ✓ contact with allergens, irritants, or another person's infected skin
- ✓ genetic factors
- ✓ illnesses affecting the thyroid, immune system, kidneys, and other body systems

The drugs used to treat these diseases can cause Trusted Source certain skin conditions, such as:

- ✓ skin tags
- ✓ anal fissures
- ✓ stomatitis
- ✓ vasculitis
- ✓ vitiligo
- ✓ allergic eczema

1.7.6 Preventing skin disorders

Follow these tips to prevent infectious skin disorders:

- ✓ Avoid sharing eating utensils and drinking glasses with other people.
- ✓ Avoid direct contact with the skin of other people who have an infection.
- ✓ Clean things in public spaces, such as gym equipment, before using them.
- ✓ Don't share personal items like blankets, hairbrushes, or swimsuits.
- ✓ Sleep for at least 7 hours each night.
- ✓ Drink plenty of water.
- ✓ Avoid excessive physical or emotional stress.
- ✓ Eat a nutritious diet.
- ✓ Get vaccinated for infectious skin conditions, such as chickenpox.

2. PLANT PROFILE



Figure No. 2.1 Azadirachta Indica

Neem is a naturally occurring herb that is derived from the neem tree, also known as *Azadirachta indica* and Indian lilac. The extract is made from the tree's seeds and has a variety of historical applications. In addition to being used in hair and dental treatments, neem is well known for its pesticide and insecticide capabilities. Traditionally, the neem tree's leaves, flowers, seeds, fruits, roots, and bark have all been used to cure fever, inflammation, infections, skin conditions, and dental issues. Neem leaf's therapeutic benefits have been specifically discussed. The immunomodulatory, anti-inflammatory, antihyperglycemic, antiulcer, antimalarial, antifungal, antibacterial, antiviral, antioxidant, antimutagenic, and anticarcinogenic activities of neem leaf and its components have been proven.

2.1. Synonyms of Azadirachta Indica

- *Azadirachta indica* var. *minor* Valetton
- *Azadirachta indica* var. *siamensis* Valetton
- *Azadirachta indica* subsp. *vartakii* Kothari, Londhe & N.P. Singh
- *Melia azadirachta* L.
- *Melia indica* (A. Juss.) Brandis

2.2 Taxonomical Classification

Kingdom: Plantae
 Subkingdom: Tracheobionta
 Division: Magnoliophyta
 Class: Eudicot
 Subclass: Rosidae
 Order: Sapindales
 Family: Meliaceae
 Genus: *Azadirachta*
 Species: *A. indica*

Plant description

The neem tree grows quickly and rarely reaches heights of 35–40 metres (115–131 feet), but it can grow to a height of 15–20 metres (49–66 feet). Although it is evergreen, in times of extreme dryness it may lose most or almost all of its leaves. The branches reach out and are broad. The roundish, moderately dense crown can grow to a diameter of 20–25 metres (66–82 feet). The Chinaberry (*Melia azedarach*), a relative of the neem tree, resembles it in look quite a little.

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