



# Herbal-Based Formulations For Vitiligo: A Comprehensive Review

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**Abstract:** This review discusses the current understanding and therapeutic applications of herbal medicines in the management of vitiligo. Herbal therapies are considered to offer a natural treatment approach with relatively fewer adverse effects compared to synthetic drugs. However, synthetic treatments are often effective in controlling disease progression, although their long-term use may be associated with adverse effects. Overall, this review aims to provide a comprehensive overview of traditional and modern herbal approaches for vitiligo management, highlighting their potential role in developing safer and more effective therapeutic strategies.

**Key words:** Vitiligo, Capsaicin, Antioxidant, Anti-inflammatory

## **Introduction:-**

Vitiligo is an acquired autoimmune skin disorder characterized by the selective destruction of melanocytes, leading to the development of depigmented patches on the skin [1]. The pathogenesis of vitiligo is multifactorial, involving autoimmune mechanisms, oxidative stress, genetic susceptibility, and neural factors [5]. Although vitiligo is not life-threatening, it significantly affects patients' psychological well-being and quality of life due to its visible nature and associated social stigma [7].

Globally, vitiligo affects approximately 0.5% to 2% of the population and commonly manifests during early adulthood [8]. According to reports by the World Health Organization, the prevalence of vitiligo in India ranges from 0.46% to 8.8%, making it a significant dermatological concern in the Indian population [9].

## **Types of Vitiligo-**

Vitiligo is broadly classified based on clinical distribution and pattern into the following types:

- 1) Non-segmental vitiligo, the most common form, characterized by symmetrical lesions and strong autoimmune association [1].
- 2) Segmental vitiligo, which follows a dermatomal pattern and usually presents at an earlier age with limited progression [5].
- 3) Mixed vitiligo, exhibiting features of both segmental and non-segmental types [8].
- 4) Universal vitiligo, a rare form involving extensive depigmentation of most of the body surface area [7].

Vitiligo is clinically classified based on the pattern, distribution, and extent of depigmentation. This classification is important for understanding disease prognosis, associated autoimmune risk, and selection of appropriate therapeutic strategies [1].

### 1. Non-Segmental Vitiligo (NSV)-

Non-segmental vitiligo is the most common form of vitiligo, accounting for approximately 85–90% of all reported cases. It is also referred to as bilateral or generalized vitiligo due to its symmetrical distribution on both sides of the body [1,2]. This type is strongly associated with autoimmune mechanisms, where cytotoxic T-cells selectively destroy melanocytes. NSV often shows a progressive and unpredictable course, with periods of stability followed by episodes of rapid depigmentation [3]. Common subtypes of non-segmental vitiligo include generalized vitiligo, acrofacial vitiligo (affecting face and extremities), mucosal vitiligo, and universal vitiligo [2]. Patients with non-segmental vitiligo frequently exhibit associated autoimmune disorders such as thyroid disease, diabetes mellitus, and pernicious anemia, indicating systemic immune dysregulation [4]. Due to its widespread nature, NSV is usually managed with medical therapies such as topical corticosteroids, calcineurin inhibitors, and phototherapy [1].

### 2. Segmental Vitiligo (SV)-

Segmental vitiligo is a less common form, accounting for approximately 5–15% of vitiligo cases. It is also known as localized or unilateral vitiligo, as it typically affects a single segment or one side of the body, often following a dermatomal or quasi-dermatomal pattern [2,3].

Unlike non-segmental vitiligo, segmental vitiligo usually appears at an earlier age and progresses rapidly for a short duration before entering a stable phase. Autoimmune associations are less frequent in this type, and neural mechanisms are believed to play a significant role in its pathogenesis [3].

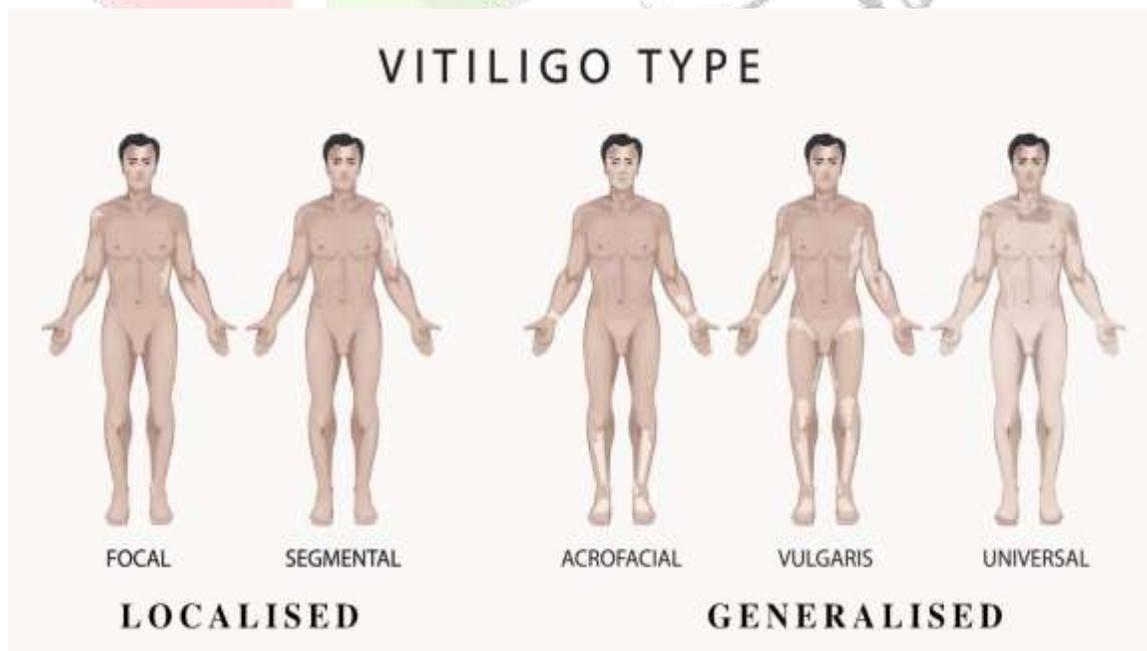
Because of its stability after initial progression, segmental vitiligo responds well to surgical interventions such as melanocyte transplantation and skin grafting when medical therapies fail [5].

### 3. Mixed Vitiligo-

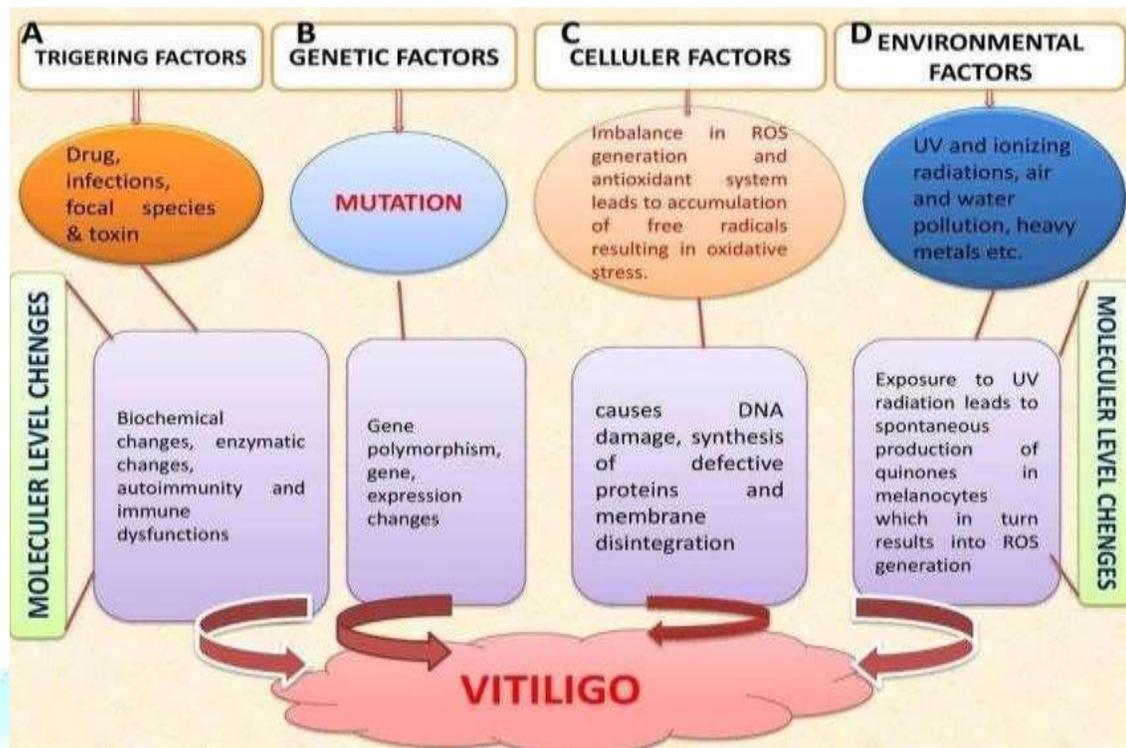
Mixed vitiligo is characterized by the coexistence of both segmental and non-segmental patterns in the same patient. This type is relatively rare and may represent a transitional form between segmental and non-segmental vitiligo [1]. The presence of mixed patterns suggests the involvement of multiple pathogenic mechanisms, including both autoimmune and neural factors

### 4. Universal Vitiligo-

Universal vitiligo is a rare and severe form characterized by depigmentation of more than 80–90% of the body surface area. It is considered an advanced variant of non-segmental vitiligo and is often associated with long disease duration and extensive melanocyte loss [4]. Management focuses mainly on cosmetic camouflage and psychological support



**Figure-1: Clinical types of vitiligo**

**Causes:****Figure-2. Causes of vitiligo.**

Vitiligo is influenced by multiple factors including autoimmune mechanisms, oxidative stress, neurological dysfunction, nutritional deficiencies, chronic inflammatory conditions, and environmental triggers such as sunburn and chemical exposure.

**Source:** Prepared by author based on literature review [1–6]

Vitiligo is a multifactorial disorder, and its development is influenced by a combination of immunological, genetic, neurological, and environmental factors. The most widely accepted mechanism is autoimmune-mediated destruction of melanocytes, where the immune system targets pigment-producing cells [1]. Psychological stress and dysfunction of the central nervous system have also been implicated in triggering or aggravating vitiligo through neurochemical mediators that affect melanocyte survival [2].

Chronic inflammatory processes and oxidative stress contribute significantly to melanocyte damage and apoptosis [3]. Nutritional deficiencies, particularly of trace elements such as copper and iron, may impair melanin synthesis and increase susceptibility to depigmentation [4]. External factors such as sunburn and chemical intoxication can induce melanocyte injury, leading to localized or generalized vitiligo [5].

Modern Therapies used In Vitiligo-The choice of treatment depend on your age how much skin is involved how, quickly the disease is progressing and how it affecting your life.

- A) Light Therapy
- B) Surgical therapy

## A) Light Therapy:-

Phototherapy with narrow band ultraviolet B(UVB)has been shown to stopper slow the progression of active vitiligo. Frequency of administration optimal 3 times per week. Acceptable-2 times per week  
Dosing protocol

- 1) Initial dose of 200 ml
- 2) Increase by 10% and 20% per treatment
- 3) Fixed dosing base on skin prototype is another acceptable dosing strategy that considers the inherent difference in minimal erythema dose(ME3)of various skin types

## B) Surgical Treatment –

- a. Skin grafting
- b. Blister grafting
- c. cellular suspension transplant

## Prevention of Vitiligo :-

Although vitiligo cannot always be prevented, certain measures may help reduce disease progression, prevent triggering factors, and improve overall skin health. Preventive strategies mainly focus on minimizing melanocyte damage, reducing oxidative stress, and maintaining psychological well-being [1].

### 1) Protection from ultraviolet radiation:

Regular use of broad-spectrum sunscreens and protective clothing is recommended to prevent sunburn, which can aggravate vitiligo lesions and induce new depigmented patches through the Koebner phenomenon [2].

### 2) Avoidance of tanning beds and sun lamps:

Artificial ultraviolet exposure from tanning devices may worsen depigmentation and increase skin sensitivity; therefore, their use should be strictly avoided [3].

### 3) Prevention of skin trauma:

Cuts, scrapes, burns, and friction should be avoided, as skin injury can trigger the development of vitiligo lesions at the site of trauma [4].

### 4)Caution with tattooing:

Tattooing may increase the risk of new lesion formation due to mechanical trauma and inflammatory responses; individuals with vitiligo should be informed about this risk [5].

### 5)Supporting immune health through a healthy lifestyle:

A balanced diet rich in antioxidants, vitamins, and trace elements may help reduce oxidative stress and support immune regulation [6].

### 6) Mental health care:

Psychological stress is considered an important triggering and aggravating factor in vitiligo. Stress-management techniques and counseling can positively influence disease outcomes [7].Social support and patient interaction: Connecting with others affected by vitiligo can improve coping ability, self-confidence, and quality of life [8].

### Marketed drugs that are used in treatment of Vitiligo

Dosage form	Side Effects
1)Betamethasone ointment	Skin irritation ,redness acne ,burning sensation ,Skin thinning [1,2]
2)Implant	Implant site reaction ,nausea ,headache[5]
3)Cyclosporine Tablet	Liver toxicity ,Kidney Damage[3]
4)Ozelura capsule	Liver issue ,nausea[4]
5)Bakuchi Oil	Irritation[6]
6)Light Therapy	Skin irritation,redness,due to long term use cause cancer[7,8]

#### ● Preferred Drugs :-

Herbal drugs	Chemical Constituents	Pharmacological action	Use
1)Capsicum	Capsaicin, caretonoid, Vitamin c	Stimulates TRPV1 receptor =Increases melanocyte activity and melanin production ;Improve blood flow to skin .	Promotes repigmentation of depigmented patches.[1,2].
2)Walnut	Polyphenol, Ellagic acid, Omega- 3 fatty acid	Antioxidant effect ,reduces oxidative stress (major factor in melamocyte death );Modulates immune response .	Protect melanocytes and supports immune balance in vitiligo.[3].
3)Green tea	Epigallocatechin	Strong antioxidant reduces ROS damage to melanocytes ;Anti -inflammatory.	Prevents progression of depigmentation & support repigmentation. [4].
4)Basil leaves	Eugenol ,rosmarinic acid	Antioxidant and immunomodulatory effect ;Protects melanocytes from autoimmune destruction .	Helps in repigmentation and control spread of vitiligo patches. [5].
5)Gilloy	Alkaloids (tinosporin ,magnoflorine ),Glycosides	Immunomodulator -balances overactive immune system ;Antioxidant support	Reduces autoimmune attack on melanocytes ;stabilize vitiligo progression. [6].

(1) Capsicum was first described in the mid-1400 by a physician who accompanied Columbus to the West Indies toluene



**Fig . -Capsicum**

Dose of capsicum-Children-0.025%-

0.075% Pregnancy- high level of dose avoided Adults-apply 3 to 4 times a day

Dosage form and Strength

Topical Cream-0.025%-0.035%, 0.075% too.1% Topical gel-0.025%

Topical liquid-0.025%

**Synonym:** Capsicum extract, Chillies, Cayenne pepper

**Family:** Solanaceae

**Biological source-**Oleoresin of Red-chillies obtained by percolation of dried ripe fruits of capsicums annum van

**Chemical constituents-** 0.5% to 0.9% colorless, crystalline and pungent known as capsaicin which volatile (4to36%), protein and pigment. Pigment is above 65 degree celsius, fixed oil (4to36%), protein and responsible for red color Thiamine and Ascorbic acid.

**Geographical source:** East Africa, west Africa and India in India found in Andhra Pradesh, Uttar Pradesh Gujarat Maharashtra, Assam and Tamil Nadu.

**Uses:**

Anti-inflammatory and antioxidant

Cucumis melo stop deconstruction of melanocytes by oxidative stress in first step of vitiligo. 3) Capsaicin used in vitiligo they stop cellular damage.

**(2) Basil leaves:**

**Synonym**-Sweet basil, Hasilic commune, Basilic Grand, Krishna Tulsi



**Biological source**:- Basil leaves is obtained from the foliage of *Ocimum basilicum*

**Family**-Lamiaceae

**Chemical constituent constituent:**

Methyl cinnamate (70.1%) Linalool (17.5%) elemene (2.6%)

Camphor (1.5)

**Geographical sources :-**

Tropical Asia, Africa, America and India

**:-**Basil is obtained from the foliage of *ocimum basilicum* L.(Sweet basil)

**Uses**- 1) Basil leaves stimulate the production of melanin

2) It is act as antibacterial and antifungal

3) It used as anti-inflammatory

**MOA**- Basil leaves, anti-aging properties Mix the leaves with some lime juice Thick paste apply on skin Keep 20 min, then increase the production of melanin.

**(3) Walnut-**

**Synonym**- Juglandaceae (Latin), English walnut, Black walnut

**Family**- Juglandaceae

**Chemical constituent**- Ash (3.4%) Lignin (50.3%)

Hemicelluloses (22.4%) Cellulose (23.9%)

**Geographical source**- Ancient Persia, USA,China,Turkey



**Uses**- 1)Reduction of the white patches caused by vitiligo.

2)It acts as an antioxidant.

3)Walnut may decrease inflammation.

**MOA-** Consume 5-7 walnut daily Try making paste by crushing walnut Walnut fine powder mix with some water. Apply paste to affected area (white patches). Then activate TRPV1 Receptor in body Helpful to reduce patches.

#### **(4) Gilloy :**

**Synonyms-** Gulvel , Tinospora, Giloy,Amrita

**Biological source-** These are the dried leaves and stem pieces of woody

**Family:-** Tinosporia cardifoliaceae

**Chemical constituent-** Tinsporine ,Tinosporic acid , Giloin ,Berberine

- Uses-**
- 1) It is as anti- inflammatory
  - 2) It is used as antioxidant
  - 3) It is act as stimulate the melanin synthesis

**MOA-** giloy (giloin) Consumed in powdered form , decoction kadha Gilloy apply topically too as a paste It binds to JAK receptor Which signal mediated melanocyte destruction Giloy helps to minimize effect.

#### **(5)Tea:-**

**Synonym-**Camellia thea



**fig. (5) Tea**

**Family:** - Theaceae

**Biological source-** It contains the prepared leaves and leaf buds of *Thea sinensis* (Linne) O.kuntze .

**Geographical source-** Tea is found in India, Sri Lanka, China, Indonesia and Japan.

**Chemical constituents-** It is rich source of caffeine (1-3%) .It also contains theobromine and theophylline in minor quantities, gallotannic acid (15%), yellow volatile oil.

**Uses-** 1)Green tea is used for improving the skin texture.

2)It is used as an antioxidant.

3)It acts as anti- anti-inflammatory.

**MOA-** Green Tea, treating the discomfort of vitiligo Best home remedy to treat vitiligo.

### **Conclusion :-**

This review article highlights the potential role of herbal drugs in the management of vitiligo. Herbal lozenges represent a promising and patient-friendly dosage form for vitiligo therapy due to their ease of administration and improved patient compliance. By incorporating phytoconstituents such as *Capsicum*, *Juglans regia* (walnut), *Ocimum basilicum* (basil), *Tinospora cordifolia* (giloy), and green tea, these lozenges may support melanogenesis, provide antioxidant protection, and modulate autoimmune responses responsible for depigmentation [1–3].

Compared to conventional therapies, herbal lozenges are considered safer, cost-effective, and more acceptable for long-term use [2,4]. Although further clinical and pharmacological studies are required to establish their efficacy and safety, this novel herbal lozenge formulation demonstrates the significant potential of phytomedicine as an alternative and complementary approach in vitiligo management.

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