Comprehensive Review on Calendula officinalis Phytochemistry, Pharmacological Activities, Traditional Uses, and Cosmetic Applications

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***Abstract*—Calendula officinalis, commonly known as calendula or pot marigold, is an important medicinal herb belonging to the family Asteraceae. The plant has been traditionally used in herbal medicine for the treatment of wounds, burns, skin inflammation, infections, and digestive disorders. Its flowers contain various bioactive compounds including flavonoids, carotenoids, triterpenoids, saponins, essential oils, and phenolic compounds. These constituents are responsible for multiple pharmacological activities such as anti-inflammatory, antimicrobial, antioxidant, wound-healing, antifungal, and immunomodulatory effects. Because of these properties, calendula has gained importance in pharmaceutical formulations, herbal cosmetics, and dermatological preparations. This review summarizes the botanical characteristics, phytochemistry, medicinal applications, pharmacological actions, safety profile, and future scope of calendula flower.**

I. INTRODUCTION

Medicinal plants have played an essential role in healthcare since ancient times. Among these plants, Calendula officinalis has gained considerable attention because of its wide therapeutic potential. The name "Calendula" comes from the Latin word calendae, meaning "little calendar," because the plant blooms throughout most of the year under favorable conditions. Calendula is widely cultivated in Europe, Asia, and North America for medicinal, ornamental, and cosmetic purposes.

Traditional medicine systems have used calendula flowers for centuries to treat skin diseases, wounds, ulcers, inflammation, and infections. In recent years, scientific research has validated many of these traditional uses by identifying its active phytochemicals and pharmacological actions.

II. TAXONOMICAL CLASSIFICATION:

Category	Classification
Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Asterales
Family	Asteraceae
Genus	Calendula
Species	Calendula officinalis

III. SYNONYMS AND COMMON NAME

Language	Name
English	Pot Marigold
Hindi	Zergul
Sanskrit	Jhandu
Marathi	Zendu
Scientific Name	Calendula officinalis

IV. GEOGRAPHICAL DISTRIBUTION:

Calendula is native to the Mediterranean region but is now cultivated worldwide. It grows well in moderate climatic conditions and fertile, well-drained soil. Major cultivation regions include:

- India
- Germany
- France
- Italy
- United States

V. MORPHOLOGICAL CHARACTERISTICS:

- Root: Calendula possesses a branched taproot system.
- Stem: The stem is erect, branched, soft, and slightly hairy.
- Leaves: Leaves are simple, oblong, green, and hairy.
- Flowers: The flowers are bright yellow to orange in color, aromatic, and arranged in flower heads.
- Seed: Seeds are curved and rough-textured.

VI. PHYTOCHEMICAL CONSTITUENTS:

Calendula flowers contain numerous bioactive compounds responsible for their medicinal effects.

6.1 Flavonoids:
Examples:

- Quercetin
- Isorhamnetin
- Kaempferol

Functions:

- Antioxidant activity
- Anti-inflammatory action

6.2 Triterpenoids:
Examples:

- Faradiol
- Arnidiol
- Calenduladiol

Functions:

- Anti-inflammatory activity
- Wound healing

6.3 Carotenoids:
Examples:

- Beta-carotene
- Lycopene
- Lutein

Functions:

- Antioxidant activity
- Skin protection

6.4 Essential Oils:
Examples:

- Alpha-cadinol
- Gamma-cadinene

Functions:

- Antimicrobial activity
- Aromatic properties

6.5 Other Constituents:

- Saponins
- Tannins
- Coumarins
- Polysaccharides
- Phenolic acids

VII. TRADITIONAL USES:

Calendula has been used traditionally for:

- Cuts and wounds
- Burns
- Skin irritation
- Insect bites
- Mouth ulcers
- Menstrual cramps
- Gastric ulcers
- Minor infections

Traditional dosage forms include:

- Herbal tea
- Tinctures
- Oils
- Ointments
- Creams
- Poultices

VIII. PHARMACOLOGICAL ACTIVITIES:

8.1 Anti-inflammatory Activity:
Calendula inhibits inflammatory mediators and reduces redness, swelling, and pain.

8.2 Wound Healing Activity:
Calendula stimulates collagen synthesis, tissue regeneration, and faster wound closure.

8.3 Antimicrobial Activity:
Studies show activity against:
Staphylococcus aureus
Escherichia coli
Candida albicans

8.4 Antioxidant Activity:
Calendula neutralizes free radicals and protects tissues from oxidative stress.

8.5 Antifungal Activity:
Useful against fungal skin infections.

8.6 Immunomodulatory Activity;
May enhance immune response by stimulating protective immune cells.

8.7 Anticancer Potential:
Some laboratory studies suggest possible anticancer effects, but more human studies are needed.

IX. COSMETIC APPLICATIONS

Calendula is widely used in cosmetic formulations such as:

- Moisturizing creams
- Anti-aging creams
- Face masks
- Lip balms
- Baby lotions
- Sunscreen preparations
- Herbal soaps

Benefits for skin:

- Hydrates dry skin
- Soothes irritation
- Reduces redness
- Improves skin healing

X. PHARMACEUTICAL APPLICATIONS

Calendula is used in:

- Topical ointments
- Dermatological creams
- Herbal gels
- Oral rinses
- Wound dressings

XI. SAFETY AND TOXICITY

Calendula is generally safe when used externally. Possible precautions:

- Allergic reactions in sensitive individuals, especially those allergic to Asteraceae plants
- Patch testing is recommended before cosmetic use

XII. FUTURE SCOPE

Future research areas include:

- Nano-herbal formulations
- Advanced wound healing systems
- Anti-aging cosmeceuticals
- Drug delivery systems
- Clinical dermatology applications

XIII. CONCLUSION

Calendula officinalis is a valuable medicinal flower with strong therapeutic potential. Its rich phytochemical composition provides anti-inflammatory, antioxidant, antimicrobial, and wound-healing effects. Because of its safety and effectiveness, calendula continues to be widely used in pharmaceutical, cosmetic, and herbal medicine industries.

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