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Phytochemistry and Pharmacological Potential of *Euphorbia Milii*: Integrating Traditional Therapeutic Applications for Anti-Tumor Activities

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ABSTRACT

Euphorbia milii, also known as the Crown of Thorns, is a plant with both ornamental and medicinal value, belonging to the *Euphorbia*ceae family. Traditionally, it has been used for various therapeutic applications, including the treatment of inflammation, microbial infections, and wound healing. The plant's latex and leaf extracts contain a variety of bioactive compounds such as flavonoids, terpenoids, alkaloids, and phenolic compounds, contributing to its pharmacological properties. Modern research has highlighted its antioxidant, anti-inflammatory, and anticancer potential. *In vitro* studies have demonstrated significant cytotoxic effects on cancer cell lines, while in vivo studies have supported its anti-inflammatory and antimicrobial effects. Despite its therapeutic promise, the latex of *Euphorbia milii* is known for its irritant properties, causing skin and ocular irritation. This review summarizes the traditional uses, phytochemical profile, pharmacological activities, and therapeutic potential of *Euphorbia milii*, while also considering its toxicity profile (Figure 1).

Keywords: *Euphorbia Milii*; Crown of Thorns; Drug Development; Traditional Medicine; Toxicity Profile

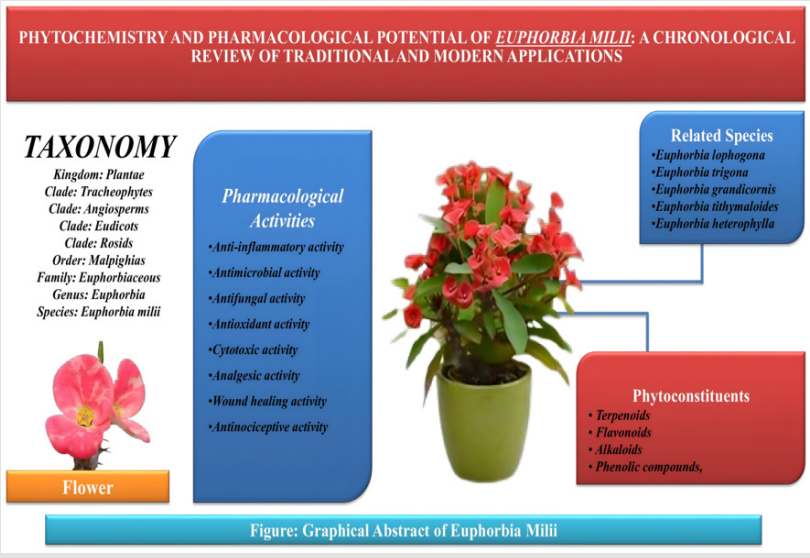

Figure 1: Graphical Representation of Euphorbia Milii.

Introduction

Euphorbia milii, commonly known as Crown of Thorns or Christ Plant, is a succulent plant native to Madagascar. It belongs to the *Euphorbia*ceae family and is characterized by its thorny stems and colorful bracts. The plant is widely cultivated for ornamental purposes, but it has also been traditionally used for various medicinal applications. The background information and details about its potential medicinal properties are as follows (Ilyas M, et al. [1]).

- **Traditional Uses:**

In traditional medicine, *Euphorbia milii* has been used to treat various ailments. Different parts of the plant, including the latex and leaves, have been employed for their medicinal properties.

- **Latex and Sap:**

The latex or sap of *Euphorbia milii* contains compounds that have been studied for their potential medicinal effects. However, it's important to note that the latex is toxic and can cause skin irritation, so caution is advised when handling the plant.

- **Anti-Inflammatory Properties:**

Some studies have suggested that certain compounds found in *Euphorbia milii* may exhibit anti-inflammatory properties. This has led to investigations into its potential use in treating inflammatory conditions (Kumar S, et al. [2]).

- **Antimicrobial Activity:**

Research has indicated that extracts from *Euphorbia milii* may possess antimicrobial properties. This suggests a potential role in fighting against certain types of bacteria and fungi.

- **Wound Healing:**

Traditionally, the latex of *Euphorbia milii* has been applied topically to wounds and skin conditions, with the belief that it may have wound-healing properties. However, more research is needed to fully understand its effectiveness in this regard.

- **Anti-Diabetic Potential:**

Some studies have explored the anti-diabetic potential of *Euphorbia milii*. Extracts from the plant have been investigated for their ability to lower blood sugar levels, although more research is necessary to confirm and understand these effects.

- **Anticancer Properties:**

Preliminary studies have suggested that certain compounds isolated from *Euphorbia milii* may have potential anticancer properties. However, more research is required to determine the safety and efficacy of these compounds for cancer treatment.

In addition to its traditional and potential medicinal uses, *Euphorbia milii* also has notable characteristics and uses:

- **Ornamental Plant:**

Euphorbia milii is primarily cultivated for its ornamental value. The plant is popular in gardens and landscapes due to its colorful bracts, which can range in color from red and pink to yellow. It is often used in horticulture for its ability to thrive in various climates and conditions.

- **Drought Tolerance:**

Euphorbia milii is known for its resilience and drought tolerance. It can survive in arid conditions and is well-suited for xeriscaping, making it a popular choice in landscapes where water conservation is a priority [Silva GH. et. al., 2021].

- **Indoor Plant:**

The Crown of Thorns plant can also be grown indoors as a potted plant. Its ability to tolerate dry indoor air makes it a low-maintenance choice for indoor gardening. However, care should be taken to provide proper sunlight and well-draining soil.

- **Symbolic and Cultural Significance:**

In addition to its horticultural and medicinal uses, *Euphorbia milii* has symbolic and cultural significance in some regions. It is associated with various religious and folk traditions and is sometimes used in rituals or ceremonies.

- **Erosion Control:**

In certain regions, *Euphorbia milii* is used for erosion control. Its deep roots help stabilize soil, preventing erosion in areas prone to soil loss.

- **Hybrid Varieties:**

There are numerous hybrid varieties of *Euphorbia milii* with different flower colors, sizes, and growth habits. Horticulturists and plant enthusiasts have developed and continue to develop new cultivars to enhance the plant's aesthetic appeal (Lee H, et al. [3]).

- **Propagation:**

Euphorbia milii can be easily propagated through stem cuttings. This makes it a popular choice for home gardeners who want to multiply their plants or share them with others.

- **Purgative Use (Historical):**

In historical contexts, some cultures used the latex of *Euphorbia milii* as a purgative, although this practice is not recommended due to the plant's toxicity (Al-Snafi AE, et al. [4]).

Morphology, Growth Habit, and Distribution of Euphorbia Milii

Morphology

Stems: *Euphorbia milii* is a succulent plant characterized by thick, fleshy stems. The stems are often covered in sharp thorns or spines,

giving the plant its common name, "Crown of Thorns." These thorns serve as a defense mechanism against herbivores.

Leaves: The leaves of *Euphorbia milii* are generally small, elliptical, and arranged alternately along the stems. The leaves may be deciduous, and their color can vary depending on the specific cultivar.

Flowers: The most striking feature of *Euphorbia milii* is its colorful bracts, which are often mistaken for flowers. The actual flowers are small and inconspicuous, located in the center of the bracts. The bracts come in various colors, including red, pink, yellow, and orange, adding to the plant's ornamental appeal (Suleiman MM, et al. [5]).

Inflorescence: The flowers are arranged in cymes, which are compact clusters at the tips of the stems. The bracts surround and overshadow the true flowers, contributing to the overall visual impact.

Latex: *Euphorbia milii* produces a milky latex or sap, which is present in all parts of the plant. This latex is toxic and can cause skin irritation, so care should be taken when handling the plant (Ahmad B, et al. [6]).

Growth Habit

Size: The size of *Euphorbia milii* can vary depending on the specific cultivar and growing conditions. It typically reaches a height of 1 to 3 feet (30 to 90 cm) and can spread to a similar width.

Habitat: *Euphorbia milii* is well-adapted to arid and semi-arid regions. It is commonly found in its native habitat in Madagascar, where it thrives in dry, rocky areas. The plant has been introduced to various tropical and subtropical regions worldwide and can be cultivated successfully in these climates.

Growth Rate: The Crown of Thorns plant has a moderate growth rate. Under favourable conditions, it can establish itself relatively quickly and produce colourful bracts throughout the growing season (Sharma M, et al. [7]).

Cultivation: *Euphorbia milii* can be grown both indoors and outdoors. It is often used as a potted plant or as part of landscaping in gardens and parks. It prefers well-draining soil and requires a sunny location for optimal growth.

Drought Tolerance: One of the notable characteristics of *Euphorbia milii* is its ability to tolerate drought. The plant stores water in its succulent stems, allowing it to withstand periods of water scarcity (Baker R, et al. [8]).

Distribution

Native Range: *Euphorbia milii* is native to Madagascar, an island in the Indian Ocean. In its natural habitat, it can be found growing in rocky, dry areas.

Global Distribution: Due to its ornamental value, *Euphorbia milii* has been introduced to many parts of the world with tropical and subtropical climates. It is cultivated as a garden plant and is commonly seen in landscapes in regions such as Asia, the Americas, and parts of Africa.

Invasive Potential: In some locations, *Euphorbia milii* has the potential to become invasive, particularly in areas with favorable growing conditions. It can spread easily through seed dispersal and vegetative propagation, competing with native vegetation.

Taxonomic Classification of *Euphorbia Milii*

- **Kingdom:** Plantae
- **Division (or Phylum):** Angiosperms (Flowering plants)
- **Class:** Eudicots
- **Order:** Malpighiales
- **Family:** *Euphorbia*ceae
- **Genus:** *Euphorbia*
- **Species:** milii (Mabberley DJ, et al. [9]).

Related Species within the Euphorbia Genus

***Euphorbia Pulcherrima* (Poinsettia):** Poinsettia is perhaps one of the most well-known species in the *Euphorbia* genus. It is widely cultivated for its rd and green foliage and is a popular ornamental plant, especially during the Christmas season.

***Euphorbia Heterophylla* (Mexican Fireplant):** Also known as the Painted *Euphorbia* or Wild Poinsettia, *Euphorbia* heterophylla is an annual plant with colourful bracts and a weedy growth habit. It is native to the Americas and can be found in various habitats.

***Euphorbia Tirucalli* (Pencil Cactus):** Pencil Cactus is a succulent shrub or small tree with a distinctive pencil-like appearance due to its slender, cylindrical branches. It is often grown as an ornamental plant in arid and subtropical regions (Christenhusz MJ, et al. [10]).

***Euphorbia Lathyris* (Caper Spurge):** Caper Spurge is a biennial or short-lived perennial known for its unique-looking flowers and seed pods. It has been historically used for medicinal and ornamental purposes. ***Euphorbia Obesa* (Baseball Plant):** The Baseball Plant is a small, globular succulent native to South Africa. Its compact, rounded shape resembles a baseball, hence the common name.

***Euphorbia Characias* (Mediterranean Spurge):** Mediterranean Spurge is a perennial shrub with attractive greenish-yellow flowers. It is native to the Mediterranean region and is cultivated as an ornamental plant.

***Euphorbia Cactus* (Various Species):** Several *Euphorbia* species are commonly referred to as "*Euphorbia* cactus" due to their cactus-like appearance. However, they are not true cacti. Some examples include *Euphorbia* lactea and *Euphorbia* trigona.

***Euphorbia Marginata* (Snow-on-the-Mountain):** Snow-on-the-Mountain is an annual plant with variegated green and white leaves. It is native to North America and is often grown as an ornamental plant (Webster GL, et al. [11]).

Recent Finding or Chronological Review

The specifications refer in Table 1.

Table 1: Recent studies or Chronological Review of *Euphorbia milii.*

S. No.	Authors	Key Findings
1	Ekpo O E, et al. [18]	Quercitrin, found in *E. hirta*, converts to quercetin in the alimentary canal. Quercetin has potent anti-inflammatory properties and is considered responsible for the anti-asthmatic properties of the plant.
2	Rauf A, et al. [19]	Phytochemical investigation of *Euphorbia milii* identified terpenoids, tannins, and flavonoids in crude extracts. Found quercetin and phenolic compounds in red flowers.
3	Sharma V, et al. [20]	The study found that *Euphorbia neriifolia* leaves and stem possess phytochemicals such as carbohydrates, proteins, amino acids, steroids, flavonoids, alkaloids, tannins, phenolic compounds, and lipids.
4	Md. Bokhtiar Rahman et al. (2015)	*Euphorbia neriifolia* is a medicinal hedge found in hilly areas of India and Bangladesh. It contains significant antioxidants like saponins, steroids, and phenolic compounds. The plant is used traditionally in Ayurveda and shows pharmacological properties.
5	Md. Majid, et al. [21]	*Euphorbia dracunculoides* is used in traditional medicine for its antioxidant, anti-inflammatory, and analgesic properties. It is used to treat rheumatism, epilepsy, and snake bites.
6	Saleem H, et al. [22]	Comparative study of biological activities and chemical composition of dichloromethane and methanol extracts of *Euphorbia milii*. Antioxidant potential was evaluated using several methods. Phenolic and flavonoid contents were analyzed using UHPLC-MS.
7	Islam Md S, et al. [23]	Reviewed various medicinal plants from the Euphorbiaceae family, including *Euphorbia milii*, highlighting their therapeutic uses against diseases like cancer, diabetes, and hepatitis.
8	Ghosh P, et al. [24]	*Euphorbia hirta* is an annual medicinal weed found in India, Bangladesh, Africa, and Australia. The plant has antimicrobial, anti-diabetic, anti-cancer, and sedative properties. The main phytochemicals are polyphenols, flavonoids, steroids, tannins, and alkaloids.
9	Salehi B, et al. [25]	*Euphorbia* is used in traditional medicine worldwide. The plant contains essential oils, sesquiterpenes, diterpenes, flavonoids, and other polyphenols. These compounds show a wide range of biological activities, including anti-inflammatory and antimicrobial properties.
10	Sumeet K. Asrani et al. (2019)	The Euphorbia genus has been studied for its hepatoprotective properties. The genus contains phenolics and flavonoids, which are responsible for its antioxidant activity.
11	Chohan A T, et al. [26]	Investigated the anticancer potential of *Euphorbia milii* using phytopharmacological and computational techniques. Chloroform fraction (Em-C) showed the highest antioxidant activity (IC50: 6.41 ± 0.99 mg/ml) and cytotoxicity against HepG2 (IC50: 11.2 ± 0.8 mg/ml).
12	Johari S, et al. [27]	Ethnobotanical study of *Euphorbia spp.* in the Thar Desert, highlighting their medicinal use. Plants such as *Euphorbia tirucalli* are used in traditional medicine and produce valuable bioactive chemicals.
13	Haleshappa R, et al. [28]	*Euphorbia milii* is widely distributed in tropical countries and is used for the treatment of various ailments. The plant has antioxidant, anti-inflammatory, anti-cancer, and antimicrobial properties.
14	Sagar S, et al. [29]	Reviewed pharmacological actions of *Euphorbia milii* Des Moul, a medicinal plant from Madagascar. It has anti-inflammatory, antioxidant, and anticancer properties. Chemical elements identified include flavonoids and triterpenes.
15	Tripathi N A, et al. [30]	*E. hirta* is an invasive plant used in conventional medicine to treat diseases like gastrointestinal and respiratory disorders. Phytochemical studies revealed the presence of flavonoids, terpenoids, and phenols as major compounds with antimicrobial and antioxidant properties.
16	Verma S P S, et al. [31]	*Euphorbia milii*, a plant from the Euphorbiaceae family, is used in Pakistan and China for various medicinal purposes. Latex is used to treat sprains, cancer, and hepatitis. Leaf extract showed analgesic and anti-inflammatory activities in rats.
17	Amataghri S, et al. [32]	Comprehensive review on the genus *Euphorbia* covering traditional medicinal uses, botanical characterization, phytochemistry, and pharmacological activities, with emphasis on their antibacterial and anti-tumor properties.
18	Abbas F A, et al. [33]	*E. milii* is used in folk medicine to treat cancer, warts, hepatitis, and eye sores. The plant contains phytochemicals like phenolic compounds, terpenoids, cardiac glycosides, and alkaloids.
19	Kaur R, et al. [34]	Investigated methanolic flower extract of *Euphorbia milii*. Found significant antioxidant capacity and metal-binding ability, with higher scavenging activity in DPPH assays.
20	Hassan Z A, et al. [35]	The ethyl acetate fraction of *E. milii* exhibited the most significant antimicrobial activity against pathogenic microbes. The LC-MS analysis identified 22 compounds, including quercitrin, luteolin, and kaempferol.

Phytochemistry of *Euphorbia Milii*

Identification and Characterization of Bioactive Compounds: *Euphorbia milii* has been the focus of several studies aimed at identifying and characterizing its bioactive compounds. The plant is rich in various secondary metabolites that contribute to its medicinal properties, including terpenoids, flavonoids, alkaloids, phenolic compounds, and tannins (Chudasama K, et al. [12]).

1. **Flavonoids:** Common flavonoids such as quercetin and kaempferol have been isolated from E. milii, showing strong antioxidant and anti-inflammatory properties.

2. **Terpenoids:** These compounds, found abundantly in E. milii, exhibit significant pharmacological activities such as anticancer, antimicrobial, and anti-inflammatory effects.

3. **Phenolic Compounds:** Phenolic compounds like tannins contribute to the antioxidant activity of *Euphorbia milii*, which helps in scavenging free radicals.

4. **Saponins and Alkaloids:** These compounds have been detected in the plant's latex and leaf extracts, contributing to its traditional use in the treatment of ailments such as cancer, sprains, and inflammatory conditions.

Extraction Methods and Techniques: To isolate and identify these compounds, various solvent extraction techniques are employed, including:

1. **Soxhlet Extraction:** This method is commonly used with solvents such as methanol, ethanol, or chloroform to obtain crude extracts.

2. **Ultrasonication and Maceration:** These methods are also frequently used to increase the yield of bioactive compounds.

3. **Chromatographic Techniques:** After extraction, techniques such as Thin Layer Chromatography (TLC), High-Performance Liquid Chromatography (HPLC), and Ultra-High-Performance Liquid Chromatography-Mass Spectrometry (UHPLC-MS) are used to separate and identify individual compounds (Ekeke C, et al. [13]).

Pharmacological Effects on Various Physiological Systems

Euphorbia milii, a member of the *Euphorbia*ceae family, contains numerous bioactive compounds such as terpenoids, flavonoids, alkaloids, and phenolic compounds, which contribute to its wide range of pharmacological effects.

Anti-inflammatory Effects: The anti-inflammatory properties of *Euphorbia milii* are well-documented. Extracts, especially from the latex and leaves, have shown significant reduction in inflammation in animal models by inhibiting cytokines and other pro-inflammatory mediators. This is primarily attributed to the presence of flavonoids and terpenoids, which interfere with the production of nitric oxide and prostaglandins, key players in inflammatory pathways.

Antioxidant Activity: *Euphorbia milii* extracts exhibit potent antioxidant properties due to their high content of phenolic compounds and flavonoids. These compounds scavenge free radicals, thereby preventing oxidative stress, which is linked to aging, cancer, and degenerative diseases. The plant's DPPH radical scavenging activity is particularly notable, with some fractions demonstrating IC50 values comparable to standard antioxidants like ascorbic acid.

Antimicrobial Activity: Studies have shown that *Euphorbia milii* possesses broad-spectrum antimicrobial properties against both Gram-positive and Gram-negative bacteria. Its efficacy against pathogenic microbes, including Staphylococcus aureus, Escherichia coli, and Candida albicans, is attributed to its rich phytochemical composition, including quercitrin, luteolin, and kaempferol.

Cytotoxic and Anticancer Effects: The anticancer properties of *Euphorbia milii* have been demonstrated in several studies. Chloroform extracts of the plant exhibit cytotoxic effects on cancer cell lines like HepG2 (liver cancer cells). These effects are thought to arise from the plant's ability to induce apoptosis and inhibit the growth of cancer cells. Additionally, molecular docking studies suggest that some bioactive compounds target key enzymes involved in cancer cell proliferation, such as cyclin-dependent kinase 2 (CDK2) (Bani S, et al. [14]).

Efficacy in Treating Specific Diseases or Conditions

Cancer Treatment: Due to its anticancer properties, *Euphorbia milii* is being explored as a potential adjunct in cancer therapy. The plant's ability to induce apoptosis in cancer cells, coupled with its low toxicity in normal cells, makes it a promising candidate for cancer treatment. *Euphorbia milii* extracts have shown cytotoxicity comparable to 5-Fluorouracil (5-FU), a common chemotherapeutic agent, particularly in the treatment of liver cancer.

Diabetes and Metabolic Disorders: Although direct studies on diabetes are limited, the plant's antioxidant properties suggest it may be useful in managing oxidative stress-related complications of diabetes. By neutralizing free radicals, it may help mitigate damage to tissues, particularly the pancreas, where insulin production occurs.

Inflammatory Diseases: The traditional use of *Euphorbia milii* to treat arthritis, sprains, and other inflammatory conditions has been validated by modern pharmacological studies. Flavonoid-rich extracts show a significant reduction in inflammation markers and pain in experimental models, making it a potential treatment for conditions like rheumatoid arthritis.

Comparison with Other Pharmaceutical Agents: When compared to synthetic pharmaceuticals, *Euphorbia milii* has shown considerable therapeutic potential, especially due to its multi-target pharmacological actions and low toxicity.

Synergistic Effects: In combination with standard anti-inflammatory drugs, such as ibuprofen or diclofenac, *Euphorbia milii* extracts may exhibit synergistic effects. This combination could reduce

the required doses of synthetic drugs, minimizing their side effects, such as gastrointestinal irritation and kidney damage.

Antioxidant Therapy: Compared to standard antioxidants like Vitamin C or Vitamin E, the polyphenolic compounds in *Euphorbia milii* have shown equal or greater efficacy in *in vitro* antioxidant assays. This makes it a promising candidate for use in nutraceutical formulations aimed at combating oxidative stress.

Antimicrobial Alternatives: The antibacterial and antifungal properties of *Euphorbia milii* are comparable to common antimicrobial agents like ciprofloxacin and fluconazole. However, unlike these synthetic agents, *Euphorbia milii* extracts demonstrate a lower risk of microbial resistance, potentially offering a more sustainable alternative to conventional antimicrobials (Zeghad F, et al. [15]).

Safety, Toxicity and Drug Development

Assessment of the Plant's Safety Profile and Potential Adverse Effects: *Euphorbia milii*, commonly known as the "Crown of Thorns," has been traditionally used for various medicinal purposes. However, its safety profile is a crucial concern when considering its therapeutic use. The plant contains latex, which includes diterpenes, phenolic compounds, and triterpenoids, all of which have pharmacological activity but may also cause toxicity.

Irritation and Dermatitis: The latex of *Euphorbia milii* is known to cause skin irritation, contact dermatitis, and allergic reactions upon contact with human skin. This is primarily due to the presence of diterpene esters, which can act as irritants. These compounds can induce burning, redness, and blistering when applied to the skin.

Ocular Toxicity: One of the primary adverse effects associated with *Euphorbia milii* is its potential to cause ocular irritation. If the latex meets the eyes, it can lead to conjunctivitis, corneal damage, and temporary blindness. Therefore, the handling of *Euphorbia milii* for therapeutic purposes must involve stringent safety protocols.

Systemic Toxicity: While there is limited data on systemic toxicity in humans, animal studies have shown that high doses of *Euphorbia milii* extracts can lead to gastrointestinal disturbances, including nausea, vomiting, and diarrhea. The plant's latex has also been linked to neurological effects in some cases, such as dizziness and confusion [Zamith, H. P. et. al., 1996].

Toxicological Studies and Identification of Risks:

- **Cytotoxicity Studies:** Although *Euphorbia milii* is considered cytotoxic to various cancer cell lines, its cytotoxic effects can extend to normal cells at higher concentrations. For instance, extracts of the plant have been shown to induce apoptosis in non-cancerous cells, highlighting the need for careful dosing and formulation in therapeutic contexts.

- **Chronic Exposure Risks:** Long-term exposure to *Euphorbia milii* extracts has not been extensively studied. However, research on related species suggests the potential for chronic liver and kidney toxicity due to the accumulation of phytochemicals like triterpenoids. There is also concern over its reproductive toxicity, as some compounds within the latex have shown anti-fertility effects in animal models (Souza S, et al. [16]).

- **Potential Contraindications:** Due to its irritant properties, *Euphorbia milii* is contraindicated for patients with pre-existing skin conditions such as eczema or psoriasis. Additionally, individuals with hypersensitivity to latex or its components should avoid using any *Euphorbia milii*-based preparations.

Progress in Drug Development Using *Euphorbia milii*: *Euphorbia milii* holds significant potential in the field of drug development due to its array of bioactive compounds, particularly in the areas of anti-cancer, anti-inflammatory, and antimicrobial therapies. Progress in this field involves both preclinical and clinical research, aimed at isolating and developing specific bioactive constituents of the plant.

Anti-Cancer Agents: Research has highlighted the potential of terpenoids and flavonoids isolated from *Euphorbia milii* as effective agents against several types of cancer. These compounds have been shown to target cancer cells by inducing apoptosis and inhibiting tumor growth, making them promising candidates for further development. Recent studies have used techniques like molecular docking to identify compounds such as BAN and CBT, which target cancer-related enzymes like CDK2.

Anti-Inflammatory Drugs: The anti-inflammatory potential of *Euphorbia milii* is being explored for use in conditions such as arthritis, inflammatory bowel disease, and other chronic inflammatory conditions. Extracts rich in flavonoids and triterpenoids have shown comparable activity to standard anti-inflammatory drugs like NSAIDs, with fewer side effects. This suggests that *Euphorbia milii* could be developed as a safer alternative to existing anti-inflammatory medications.

Antimicrobial Development: The antimicrobial properties of *Euphorbia milii* extracts have prompted interest in developing natural antibiotics. Studies have shown that these extracts are effective against multi-drug-resistant bacteria, making them a potential resource in combating antibiotic-resistant infections.

Formulation and Delivery: The challenge in drug development lies in the formulation of *Euphorbia milii* compounds into a safe and effective dosage form. Nanoformulations, such as liposomal encapsulation or polymeric nanoparticles, are being investigated to improve the bioavailability of these compounds while reducing their irritant and toxic effects (Hossain S M, et al. [17]).

Conclusion and Future Perspectives

Euphorbia milii shows significant potential as a source of bioactive compounds with various therapeutic applications. Its documented anti-inflammatory, antioxidant, and anticancer activities are promising for the development of novel pharmaceuticals, particularly in treating chronic inflammatory diseases and certain cancers. However, caution must be exercised due to the toxic effects of the plant's latex, which includes skin and ocular irritants. Although current research supports the efficacy of *Euphorbia milii* in traditional medicine, its safe use requires further investigation into its toxicity and dosage regulation. Standardizing extraction methods and optimizing formulations for safer therapeutic use should be a priority [18-39].

Future Prospectives

Further research is needed to fully elucidate the molecular mechanisms underlying the therapeutic properties of *Euphorbia milii*. Isolating specific bioactive compounds and testing them in clinical settings will be key to advancing its pharmaceutical applications. Additionally, developing novel formulations, such as nano-based delivery systems, could improve the bioavailability of its compounds while reducing toxicity. Comprehensive toxicological evaluations and long-term safety studies will be necessary to ensure its safe incorporation into modern medicine. Clinical trials assessing the plant's efficacy in humans could validate its potential for treating various diseases, including inflammatory conditions and cancer.

Competing Interests

The authors declare no competing of Interest, financial or otherwise authors contributions.

Authors Contribution

All authors participated in the conception and design of the study. Kartikay Prakash: Designed and wrote the manuscript. Shivani Agarwal: Conceptualized and Supervised the study. The authors have read and agreed to the published version of the manuscript.

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Availability of Data and Material

The authors confirms that the data supporting the findings of this study are available within the article.

Ethical Approval

Not Required.

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