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Herbal Treatment in Leukemia: A Review of Medicinal Plants Effective in Blood Cancer

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A B S T R A C T

Objective: Leukemia is one of the most common causes of death worldwide. It is a group of cancers that typically start in the bone marrow and result in the production of large numbers of abnormal white blood cells. These white blood cells do not fully develop and are referred to as "blasts" or "leukemic cells," also known as blood cancer. Medicinal plants have been used in traditional medicine for cancer treatment. The aim of this study is to identify the most important medicinal plants used in traditional medicine for the treatment of leukemia.

Methodology: This review article was conducted by searching for keywords such as "medicinal plants" and "blood cancer" in databases such as Web of Science, Medline, PubMed, Scopus, and Google Scholar. Relevant articles were selected for the literature review.

Results: Medicinal plants such as *Periwinkle* (Vinca), *Chili*, *Yew*, *Mistletoe*, *Night Jasmine*, *Vernonia*, *Methi*, *Devil's Claw*, *Snake Root*, *Marsh Apple*, *Olive*, and *Mexican Sunflower* have been used in the treatment of leukemia.

Conclusion: Medicinal plants are rich in plant antioxidants and possess anti-leukemic properties due to their bioactive compounds.

Keywords: Cancer, Leukemia, Medicinal plants, Treatment

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Introduction

Leukemia, also known as blood cancer, is a group of cancers in which the production and function of white blood cells are disrupted [1]. This type of cancer typically originates in the bone marrow and leads to the production of abnormal white blood cells (blasts) [1]. These cells do not fully mature and are incapable of performing their natural functions within the immune system [2]. Leukemia exists in several forms, including acute and chronic leukemia, each with its own distinct characteristics [3]. Treatment for leukemia typically involves chemotherapy, radiation therapy, stem cell transplants, and biological therapies [4]. However, chemical treatments and radiation therapy are often associated with numerous side effects, which can affect the quality of life of patients [5]. As a result, the use of medicinal plants as complementary and alternative therapies, particularly in traditional medicine, has gained attention [6].

Herbal remedies are traditional home treatments for this condition [7]. In leukemia treatment, certain medicinal plants possess anti-cancer properties that can inhibit the growth of cancer cells and prevent their spread [7]. These plants may act through mechanisms such as inhibiting cell division, promoting apoptosis (programmed cell death), reducing inflammation, and strengthening the immune system. Additionally, some medicinal plants may indirectly improve the general condition of the patient by reducing the

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negative effects of chemotherapy and radiation therapy and minimizing the side effects of these treatments [8].

In traditional medicine, various medicinal plants have been used to treat leukemia. Some of these plants exhibit antioxidant, anti-inflammatory, and anti-cancer properties [9]. Numerous studies have shown that medicinal plants can significantly reduce symptoms and improve the treatment process of leukemia [10]. Some clinical studies have indicated that compounds found in medicinal plants may help reduce tumors and cancer cells by strengthening the immune system, inhibiting the proliferation of leukemia cells, and inducing apoptosis in cancer cells. However, while initial evidence of the positive effects of medicinal plants in leukemia treatment is promising, further studies are needed to conclusively confirm their effects and safety in the treatment of blood cancer [11]. The aim of the present review study is to identify the most important medicinal plants used in traditional medicine for the treatment of leukemic.

Methodology

This study is a review article. To identify medicinal plants effective in the treatment of leukemia, a systematic search was conducted in reputable scientific databases such as Web of Science, Medline, PubMed, Scopus, and Google Scholar. Keywords like "medicinal plants" and "blood cancer" were used in the search. Relevant articles published on the use of medicinal plants in leukemia treatment were collected and carefully reviewed. Specific criteria, such as the relevance of topics, were considered for selecting suitable articles. After gathering the articles, the data were analyzed, and results were extracted to identify medicinal plants effective in leukemia treatment.

Results

In this study, various medicinal plants such as Vinca major (Periwinkle), Capsicum annuum (Chili), Taxus baccata (Yew), Viscum album (Mistletoe), Cestrum nocturnum (Night Jasmine), Vernonia amygdalina (Vernonia), Trigonella foenum-graecum (Methi), Harpagophytum procumbens (Devil's Claw), Rauvolfia serpentina (Snake Root), Colocasia esculenta (Marsh Apple), Olea europaea (Olive), and Tithonia diversifolia (Mexican Sunflower) have been identified as natural treatments for leukemia. Additional information about these medicinal plants' anti-leukemia effects is presented in Table

Table 1: Medicinal Plants for Leukemia Treatment

Persian Name	English Name	Scientific Name	Plant Family	Mechanism of Action
Gole pichak	Periwinkle	Vinca major	Apocynaceae	Inhibition of cell division and reduction of cancer cell growth due to alkaloid compounds like vincristine [12].
Chil	Chilli	Capsicum annuum	Solanaceae	Stimulation of the immune system and anti-inflammatory properties through capsaicin [13].
Ticoslolei	Yew	Taxus baccata	Taxaceae	Inhibition of mitotic enzymes and halting cell division at specific stages with paclitaxel [14].
Derakhte mistloo	Mistletoe	Viscum album	Santalaceae	Strengthening the immune system and stimulating defense mechanisms against cancer [15].
Yasaminshab	Night Jasmine	Cestrum nocturnum	Solanaceae	Anti-tumor effects through active phytochemical compounds [16].

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Vernonia	Vernonia	Vernonia amygdalina	Asteraceae	Anti-inflammatory and antioxidant effects through phenolic and flavonoid compounds [17].
Mitnus	Methi	Trigonella foenum-graecum	Fabaceae	Reduction of inflammation and inhibition of cancer cell growth via saponins and alkaloids [18].
Jezrsheytan	Devil's Claw	Harpagophytum procumbens	Pedaliaceae	Anti-inflammatory effects and immune system enhancement via harpagoside [19].
Domemar	Snake Root	Rauvolfia serpentina	Apocynaceae	Reduction of cancer cell activity through alkaloids like reserpine [20].
Sibmordab	Marsh Apple	Colocasia esculenta	Araceae	Antioxidant and anti-inflammatory effects leading to inhibition of cancer tumor growth [21].
Zeytoun	Olive	Olea europaea	Oleaceae	Antioxidant and anti-inflammatory properties, inhibition of cancer cell growth with polyphenols [22].
Aftabgaradan mekziki	Mexican Sunflower	Tithonia diversifolia	Asteraceae	Stimulation of the immune response and anti-cancer effects through antioxidant compounds [23].

Based on the analysis of medicinal plants used in the treatment of leukemia, the distribution of plants by botanical family is as follows:

Apocynaceae includes two plants, Vinca major (Periwinkle) and Rauvolfia serpentina (Snake Root). This family contains alkaloids such as vincristine and reserpine, which help inhibit cancer cell growth.

Solanaceae also includes two plants, Capsicum annuum (Chili) and Cestrum nocturnum (Night-blooming Jasmine). The compounds found in these plants, such as capsaicin and phytochemicals, have anti-inflammatory and anti-cancer properties that support immune system enhancement and inhibition of cancer cell growth.

Taxaceae: Taxus baccata (Yew) is the only plant in this family. Its primary compound, paclitaxel, halts cell division at specific stages, helping to treat leukemia.

Santalaceae: Viscum album (Mistletoe) is the sole plant in this family, which helps boost the immune system and stimulates the body's defense mechanisms against cancer.

Asteraceae: This family includes two plants, Vernonia amygdalina (Vernonia) and Tithonia diversifolia (Mexican Sunflower). Due to their phenolic and flavonoid compounds, these plants exhibit anti-inflammatory and antioxidant effects, which contribute to the reduction of tumor growth.

Fabaceae: Trigonella foenum-graecum (Fenugreek) is the only plant in this family. It helps reduce inflammation and inhibit cancer cell growth through saponins and alkaloids.

Pedaliaceae: Harpagophytum procumbens (Devil's Claw) provides anti-inflammatory effects and enhances immune function through the compound harpagoside.

Araceae: Colocasia esculenta (Marsh Apple) is the only plant in this family. It has antioxidant and anti-inflammatory properties that help suppress tumor growth.

Oleaceae: Olea europaea (Olive) is also part of this family. Its antioxidant and anti-inflammatory compounds can assist in inhibiting cancer cell growth.

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This analysis reveals that the families Apocynaceae, Solanaceae, and Asteraceae contain the highest number of plants, each representing 18.18% of the total plants. This plant diversity is highly significant in leukemia treatment, offering valuable insight for researchers and healthcare professionals in selecting effective herbal treatments. Other families each contain only one plant, but each has unique properties contributing to the treatment of this disease.

Discussion

Leukemia is a type of blood cancer caused by the abnormal proliferation of white blood cells in the bone marrow. In the treatment of leukemia, alongside chemotherapy and radiotherapy, the use of medicinal plants as therapeutic supplements has attracted significant attention.

Vinca major (Periwinkle) is a widely used plant in leukemia treatment. It contains alkaloids such as vincristine and vinblastine, which inhibit cell division and reduce the growth of cancer cells [12]. Capsaicin found in Capsicum annuum (Chili) stimulates the immune system and possesses anti-inflammatory properties, which help reduce inflammation in leukemia [13]. Paclitaxel, the main compound in Taxus baccata (Yew), inhibits mitotic enzymes and halts cell division in leukemia cells, preventing cancer cell growth [14]. The immunomodulatory and antioxidant properties of Viscum album (Mistletoe) enhance the immune system against cancer, especially leukemia [15]. Cestrum nocturnum (Night-blooming Jasmine), with its antioxidant and anti-tumor compounds, is beneficial in treating leukemia and blood cancers [16]. Vernonia amygdalina (Vernonia) contains phenolic compounds and flavonoids that have anti-inflammatory and antioxidant effects, which help in reducing cancer cell growth [17]. The saponins and alkaloids in Trigonella foenum-graecum (Fenugreek) contribute to inhibiting cancer cell growth and reducing inflammation in leukemia [18]. Harpagophytum procumbens (Devil's Claw) contains harpagoside, which enhances immune function and reduces inflammation, demonstrating anti-tumor effects [19]. Rauvolfia serpentina (Snake Root) contains alkaloids like reserpine, which exhibit anti-cancer properties in leukemia and other cancers [20]. The antioxidant and anti-inflammatory compounds in Colocasia esculenta (Marsh Apple) inhibit tumor growth [21]. The polyphenols and oleocanthal in Olea europaea (Olive) provide antioxidant and anti-inflammatory benefits, making it useful in treating leukemia [22]. Tithonia diversifolia (Mexican Sunflower) has antioxidant compounds and strengthens the immune system, providing anti-cancer effects and aiding in leukemia treatment [23].

Conclusion

Medicinal plants, with their active compounds, can specifically assist in the treatment of leukemia through various mechanisms, including the inhibition of cell division, immune system enhancement, reduction of inflammation, and antioxidant effects. This review explores the traditional effects and active constituents of plants used in the treatment of leukemia.

Statements and Declarations

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Competing interests

The authors have no competing interests to declare that are relevant to the content of this article.

Ethics approval

This study was performed in line with the principles of the Declaration of Helsinki.

Consent to participate

Informed consent was obtained from all individual participants included in the study.

Author contributions

SN: Conceptualization, the original draft writing, investigation, writing including reviewing and editing and investigation and formal analysis; PP: Conceptualization, supervision, and project administration; PP and SN Conceptualization, the original draft writing, investigation, writing including reviewing and editing.

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