

Therapeutic Potential and Phytochemical Profile of *Vinca herbacea*

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Dear Editor

Medicinal plants continue to represent an invaluable source of bioactive compounds for drug discovery and development. Among these, *Vinca herbacea* Waldst. & Kit., a perennial herb belonging to the family Apocynaceae, has received considerably less scientific attention compared to its well-known relatives such as *Vinca major* and *Vinca minor*. However, accumulating evidence suggests that this species possesses a diverse phytochemical composition and considerable pharmacological potential, highlighting the need for further investigations from phytochemical, pharmacognostic, and pharmacological perspectives [1-3].

The genus *Vinca* is widely recognized for producing a broad range of indole alkaloids, many of which exhibit significant biological activities. While extensive research has been conducted on anticancer alkaloids such as vinblastine and vincristine in related species, the phytochemical profile of *V. herbacea* remains largely underexplored. Recent studies have reported the presence of multiple classes of secondary metabolites, including indole alkaloids, flavonoids, phenolic compounds, terpenoids, and other bioactive constituents. These compounds are likely responsible for many of the observed biological activities and may serve as promising leads for future drug discovery [3-5].

One of the most important characteristics of *V. herbacea* is its alkaloid content. Indole alkaloids constitute a structurally diverse group of natural products with a wide range of pharmacological activities, including anticancer, anti-inflammatory, antimicrobial, and neuroprotective effects. Recent phytochemical investigations have confirmed the presence of several valuable alkaloids in this species. Moreover, the identification of newly reported compounds

in recent years indicates that the chemical profile of this plant is still far from being fully elucidated. The application of modern analytical techniques such as gas chromatography–mass spectrometry (GC–MS), liquid chromatography–mass spectrometry (LC–MS), nuclear magnetic resonance (NMR) spectroscopy, and metabolomics approaches has significantly enhanced our understanding of its chemical diversity and continues to reveal previously unknown constituents [3,6-8].

In addition to its phytochemical richness, *V. herbacea* has demonstrated various biological activities in experimental studies. Extracts obtained from different parts of the plant have shown notable antioxidant properties, most likely due to their phenolic and flavonoid content. Oxidative stress is a major contributing factor in the development of many chronic diseases, including cancer, cardiovascular disorders, neurodegenerative diseases, and diabetes. Therefore, plant-derived antioxidants remain of considerable interest as potential preventive and therapeutic agents [1,4,5,9-11].

Preliminary studies have also suggested that *V. herbacea* may exhibit antimicrobial activity against certain bacterial and fungal pathogens. Given the growing global concern regarding antimicrobial resistance, the discovery of new antimicrobial compounds from natural sources is of great importance. Plant secondary metabolites may offer alternative or complementary strategies to conventional antibiotics in combating resistant microorganisms [1,3,5,7,9-11].

The anticancer potential of this species represents another important area for future research. Many indole alkaloids are known to interfere with cell proliferation, apoptosis, and microtubule dynamics. Although the anticancer activity of *V. herbacea* has not been investigated as extensively as that of other Apocynaceae members, its structural similarity to known cytotoxic alkaloids suggests that it may serve as a valuable source of novel anticancer lead compounds. Further in vitro, in vivo, and molecular studies are required to elucidate the underlying mechanisms of action and evaluate its therapeutic potential [1,9-11].

From a pharmacognostic perspective, the accurate identification and standardization of *V. herbacea* are essential to ensure the authenticity, quality, and safety of herbal preparations. Detailed macroscopic, microscopic, physicochemical, and phytochemical characterization is necessary to establish reliable quality control parameters. Such studies are also important for distinguishing this species from other members of the genus *Vinca*, thereby preventing adulteration and misidentification in herbal products [3-8].

Another significant aspect is the geographical distribution of *V. herbacea* across various regions of Europe, the Caucasus, and Western Asia. Environmental factors such as climate, soil composition, altitude, and habitat conditions can significantly influence the biosynthesis and accumulation of secondary

metabolites. Therefore, comparative studies of different populations may help identify distinct chemotypes and reveal novel bioactive compounds. However, most existing phytochemical investigations have been limited to a small number of populations, indicating the need for broader geographical and ecological sampling [1-5].

Recent advances in metabolomics, molecular pharmacology, and computer-aided drug design have opened new opportunities for studying underexplored medicinal plants. The integration of these modern approaches with classical phytochemical and pharmacognostic methods can facilitate the discovery of novel compounds and provide deeper insights into their mechanisms of action. In addition, the development of plant tissue culture, micropropagation, and in vitro production systems offers a sustainable strategy for producing valuable secondary metabolites while reducing pressure on natural populations [1,3,5,9-13].

In conclusion, *V. herbacea* remains a promising yet insufficiently studied medicinal plant with significant phytochemical diversity and therapeutic potential. Its rich repertoire of indole alkaloids, flavonoids, and other secondary metabolites, along with reported antioxidant, antimicrobial, and potential anticancer activities, underscores the need for further comprehensive investigations. Since its chemical profile is still not fully characterized and new compounds continue to be reported, future research should focus on complete phytochemical profiling, biological evaluation, pharmacognostic standardization, tissue culture development, and conservation strategies. Such integrated efforts may ultimately establish *V. herbacea* as an important source of novel bioactive compounds for future drug discovery and development

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Conflicts of interest

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