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# ANTICANCER EFFECTS OF CATHARANTHUS ROSEUS: FROM AYURVEDIC AND TRADITIONAL CHINESE MEDICAL USE TO PRECLINICAL AND CLINICAL ONCOLOGY

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## ABSTRACT

*Catharanthus roseus (*Madagascar periwinkle) is one of the most important medicinal plants in modern cancer pharmacology because it gave rise to the vinca alkaloids, especially vinblastine and vincristine. At the same time, it occupies a distinct place in traditional medicine, where it is known as Sadabahar/Sadaphuli in Ayurveda-oriented Indian practice and Chang Chun Hua (長春花) in Chinese herbal use. This review critically synthesizes traditional medicine references, phytochemistry, anticancer mechanisms, preclinical studies on crude extracts, and clinical evidence derived from purified alkaloids and semisynthetic congeners. Contemporary ethnopharmacologic literature shows that *C. roseus* contains a chemically rich metabolome dominated by monoterpene indole alkaloids and bisindole alkaloids, while mechanistic studies establish that its principal anticancer agents disrupt tubulin dynamics, induce mitotic arrest, and trigger apoptotic cell death. Experimental studies demonstrate that aqueous and methanolic leaf extracts exert cytotoxic and pro-apoptotic activity in leukemia and breast cancer cell models, although standardization, active-principle attribution, and translational robustness remain limited. In contrast, the clinical anticancer contribution of *C. roseus* is definitive when considered through plant-derived vinca alkaloids: vincristine remains fundamental in pediatric acute lymphoblastic leukemia, vinblastine is embedded in Hodgkin lymphoma regimens, and vinorelbine has demonstrated activity in

non-small-cell lung cancer. Overall, the evidence indicates that the anticancer value of *C. roseus* is clinically validated primarily through purified alkaloids rather than crude botanical preparations. Future progress depends on biosynthetic engineering, extracts standardization, toxicity-aware development, and rigorously designed clinical trials of well-characterized plant preparations. [1-14]

**KEYWORDS:** *Catharanthus roseus*; Madagascar periwinkle; Ayurveda; traditional Chinese medicine; anticancer activity; leukemia.

## INTRODUCTION

*Catharanthus roseus* is a Madagascar-native member of Apocynaceae that has become globally naturalized and medicinally important. Its scientific significance far exceeds its ornamental value because it is the botanical source of the vinca alkaloids, among the earliest and most successful plant-derived anticancer drugs. The discovery of vinblastine and vincristine from a plant initially investigated for antidiabetic folklore use represents a classic example of translational ethnopharmacology, where traditional knowledge helped redirect biomedical research toward oncology. [1,5,6]

The anticancer story of *C. roseus* is therefore dual. On one hand, it belongs to the materia medica of contemporary traditional systems. On the other, its globally accepted oncologic role rests on purified natural products and their derivatives rather than on whole-plant empirical use. A high-quality review of its "anticancerous effect" must acknowledge both dimensions while clearly separating ethnomedical relevance from experimentally and clinically validated anticancer efficacy. [1,6,8]

### Traditional medicine evidence for *Catharanthus roseus*

A critical reading of the traditional literature suggests that *C. roseus* should be interpreted as an introduced rather than a deeply primordial drug in the oldest classical canons, because the species is native to Madagascar. Nonetheless, current Ayurvedic review literature documents its incorporation into later Nighantu/API-linked discussions under the names Sadaphuli and Sadabahar. These sources describe bitter taste (*tikta rasa*), light/dry/cooling attributes (*laghu, ruksha, sheeta guna*), cooling potency, and uses in disorders such as diabetes, hypertension, dysmenorrhea, and, in later therapeutic discourse, leukemia/cancer-related conditions. Importantly, Ayurvedic authors themselves note that the plant entered medicinal use comparatively later and requires stronger evidence-based establishment. [2]

Traditional Chinese references likewise support medicinal use of the plant under the name Chang Chun Hua (長春花). The Hong Kong Hospital Authority toxic plant monograph records use of the whole plant in TCM for "removing toxin," "anti-cancer," reducing blood pressure, clearing heat, and pacifying the liver, with a recommended dose of 5-10 g. Flora of China additionally records that decoctions of all parts are used medicinally, including for Hodgkin disease, hypertension, and diabetes. These references are valuable because they demonstrate real traditional and regional medical adoption, while also warning that the same plant contains toxic alkaloids and cannot be presumed safe in crude form. [3,4]

**Phytochemistry and mechanistic basis of anticancer activity in *Catharanthus roseus***

The anticancer relevance of *C. roseus* rests chiefly on its monoterpene indole alkaloid (TIA) biosynthetic machinery. A major ethnopharmacologic review catalogued 344 compounds from the plant, including 110 monoterpene indole alkaloids, 35 bisindole alkaloids, flavonoids, phenolic acids, and volatile constituents. Among these, vinblastine and vincristine are the most important clinically. This exceptional chemical diversity explains why the plant continues to attract interest not only in pharmacognosy, but also in biosynthetic engineering and pharmaceutical biotechnology. [1]

Mechanistically, vinca alkaloids act as microtubule-disrupting spindle poisons. They bind tubulin, inhibit microtubule polymerization and dynamics, arrest mitosis at metaphase, and ultimately promote cancer cell death. Reviews on TIA biosynthesis further show that production of these alkaloids is intrinsically complex and naturally very low, which has historically limited direct plant extraction and stimulated research into tissue culture, metabolic engineering, elicitation, and endophyte-assisted production systems. Thus, the anticancer potential of *C. roseus* depends not only on pharmacology, but also on solving the biological problem of low alkaloid yield. [6-8]

**Preclinical and experimental evidence**

Experimental work on crude or semi-crude *C. roseus* preparations supports genuine anticancer bioactivity, but the evidence remains mostly preclinical. In a study on Jurkat leukemic T cells, aqueous leaf extract produced time- and dose-dependent cytotoxicity, with IC50 values of 2.55 µg/mL at 48 h and 2.38 µg/mL at 72 h, alongside DNA fragmentation consistent with apoptosis. Notably, the same study observed proliferative effects on normal peripheral blood mononuclear cells, suggesting differential activity between malignant and

non-malignant immune cells. This finding is intriguing, although it also underscores the complexity of crude extracts and the risk of overinterpreting in vitro selectivity. [9]

Another study using methanolic leaf extract against MDA-MB-231 human breast cancer cells found significant cytotoxicity and apoptosis, with an IC50 of 57.64 µg/mL after 24 h and increased early/late apoptotic fractions on flow cytometry. Such data support the concept that beyond vincristine and vinblastine, the plant contains additional bioactive constituents that may contribute to antiproliferative effects. However, these investigations still face common limitations: crude extract variability, incomplete phytochemical standardization, absence of pharmacokinetic relevance, and uncertain attribution of activity to single compounds versus synergistic mixtures. [10]

Taken together, the preclinical literature justifies continued research on *C. roseus* extracts, fractions, and minor alkaloids. Nevertheless, it does not yet justify equating crude plant preparations with clinically validated anticancer therapy. The translational bridge remains incomplete because most experimental studies stop at in vitro cytotoxicity, with insufficient in vivo oncology models, dose optimization, toxicology integration, and controlled human testing. [1,8-10]

**Clinical evidence: where the anticancer effect is definitively established**

The clinical success of *C. roseus* is most convincingly expressed through its isolated alkaloids and semisynthetic derivatives, not through whole-plant administration. Historically, the plant was screened for putative hypoglycemic activity, but investigators instead discovered marked leukopenic and antitumor effects, leading to the isolation of vinblastine and vincristine. This discovery changed cancer chemotherapy and remains one of the strongest examples of a medicinal plant reshaping mainstream oncology. [5,6]

In pediatric hematologic oncology, vincristine remains foundational. In the EORTC 58951 randomized phase III trial, the addition of vincristine/corticosteroid pulses during continuation therapy in average-risk childhood ALL/NHL improved 6-year disease-free survival to 90.6% versus 82.8% in the no-pulse group, supporting vincristine as a standard component of therapy. This is a critical point: the anticancer effect of Madagascar periwinkle is not merely theoretical or historical; it continues to improve survival in modern evidence-based treatment protocols. [11]

Vinblastine is equally important in lymphoma therapy. The landmark ABVD study demonstrated that the regimen of adriamycin, bleomycin, vinblastine, and dacarbazine achieved complete remission rates comparable to MOPP in advanced Hodgkin

disease and became the foundation for one of the most influential regimens in lymphoma history. Thus, a plant-derived alkaloid from *C. roseus* became incorporated into one of oncology's classic curative combinations. [12]

Semisynthetic congeners extend this clinical lineage to solid tumors. In non-small-cell lung cancer, phase II vinorelbine monotherapy produced a 29.4% partial response rate and median survival of 33 weeks, while a randomized phase III trial showed that vinorelbine plus cisplatin increased response rate (43% vs 16%) and time to progression compared with vinorelbine alone, albeit at the cost of higher toxicity. These studies are directly relevant to the review topic because they demonstrate that the anticancer legacy of *C. roseus* extends beyond natural alkaloids to clinically useful semisynthetic descendants. [13,14]

Accordingly, the most defensible conclusion is that clinical validation of the anticancer effect of *C. roseus* resides predominantly in vincristine, vinblastine, and related vinca alkaloids, whereas direct clinical evidence for crude herbal formulations remains sparse or absent. [6,8,11-14]

**Safety, toxicity, and translational limitations**

Any serious review must emphasize that *C. roseus* is not a benign anticancer herb. Traditional sources themselves acknowledge toxic potential, and official toxic-plant references document alkaloid-mediated inhibition of mitosis, with poisoning manifestations including paresthesia, stomatitis, paralytic ileus, myalgia, fever, bone marrow suppression, and even multi-organ failure. A documented poisoning event followed use of the plant as an alternative anticancer treatment. These facts strongly argue against unsupervised crude self-medication for cancer. [3]

At the translational level, four barriers remain prominent: extremely low natural alkaloid yield; variability across chemotypes, organs, and extraction methods; narrow therapeutic windows of active alkaloids; and the absence of rigorous clinical trials of standardized botanical preparations. For this reason, the oncology success of *C. roseus* has depended on pharmaceutical purification, dose control, and regimen integration rather than simple direct plant use. [1,7,8]

**Future directions**

Future work should move in two parallel directions. First, the drug-development track should continue optimizing biosynthetic engineering, endophyte-assisted production, and formulation science to improve yield, reduce toxicity, and overcome resistance of vinca

alkaloids. Second, the botanical-medicine track should focus on well-standardized extracts, chemical fingerprinting, orthotopic/in vivo tumor models, herb-drug interaction studies, and early-phase clinical trials only after toxicologic clarity is established. Without this two-track strategy, the field risks either romanticizing traditional use or overlooking potentially valuable non-vinca constituents. [7,8]

## CONCLUSION

*Catharanthus roseus* is among the rare medicinal plants for which the phrase "anticancer effect" is supported at three distinct levels: traditional reputation, preclinical experimental activity, and incontrovertible clinical translation through purified alkaloids. Yet these levels are not equivalent. Traditional Ayurveda and TCM references establish ethnomedical relevance; in vitro and mechanistic studies confirm biologic plausibility; but the strongest human evidence belongs to vincristine, vinblastine, and semisynthetic vinca derivatives embedded in standard oncology practice. Therefore, the best contemporary scientific position is that *C. roseus* is a historically important medicinal plant whose anticancer potential has been fully realized clinically through modern phytopharmaceutical development, while standardized whole-plant cancer therapeutics remain an open research question rather than an established therapy. [1-14]

## REFERENCES

1. Kumar S, Singh B, Singh R. *Catharanthus roseus* (L.) G. Don: A review of its ethnobotany, phytochemistry, ethnopharmacology and toxicities. J Ethnopharmacol. 2022;284:114647. doi:10.1016/j.jep.2021.114647.
2. Kale A. A scientific review on Sadaphuli in Ayurveda. J Ayurveda Integr Med Sci. 2021;6(3):94-99. Available from: https://jaims.in/jaims/article/view/1309
3. Hospital Authority Toxic Plant Database. *Catharanthus roseus*. Hong Kong: Hospital Authority; [cited 2026 Jun 25]. Available from: https://www3.ha.org.hk/toxicplant/en/catharanthus_roseus.html
4. Flora of China Editorial Committee. *Catharanthus roseus*. In: Flora of China [Internet]. [cited 2026 Jun 25]. Available from: http://www.efloras.org/florataxon.aspx?flora_id=3&taxon_id=200018366
5. Noble RL. The discovery of the vinca alkaloids--chemotherapeutic agents against cancer. Biochem Cell Biol. 1990;68(12):1344-51.

6. Taub JW, Buck SA, Xavier AC, Edwards H, Ge Y. The evolution and history of Vinca alkaloids: From the Big Bang to the treatment of pediatric acute leukemia. Pediatr Blood Cancer. 2024;71(11):e31247. doi:10.1002/pbc.31247.
7. Zhu J, Wang M, Wen W, Yu R. Biosynthesis and regulation of terpenoid indole alkaloids in Catharanthus roseus. Pharmacogn Rev. 2015;9(17):24-28. doi:10.4103/0973-7847.156323.
8. Banyal A, Tiwari S, Sharma A, Chanana I, Kumar P, Choi EH. Vinca alkaloids as a potential cancer therapeutics: recent update and future challenges. 3 Biotech. 2023;13(6):211. doi:10.1007/s13205-023-03636-6.
9. Ahmad NH, et al. Catharanthus roseus aqueous extract is cytotoxic to Jurkat leukaemic T-cells but induces the proliferation of normal peripheral blood mononuclear cells. Trop Life Sci Res. 2010;21(2):101-113.
10. Rajashekara S, et al. Biological isolation and characterization of Catharanthus roseus (L.) G. Don methanolic leaves extracts and their assessment for antimicrobial, cytotoxic, and apoptotic activities. BMC Complement Med Ther. 2022;22(1):328. doi:10.1186/s12906-022-03810-y.
11. De Moerloose B, Suciu S, Bertrand Y, et al. Improved outcome with pulses of vincristine and corticosteroids in continuation therapy of children with average risk acute lymphoblastic leukemia (ALL) and lymphoblastic non-Hodgkin lymphoma (NHL): report of the EORTC randomized phase 3 trial 58951. Blood. 2010;116(1):36-44. doi:10.1182/blood-2009-10-247965.
12. Bonadonna G, Zucali R, Monfardini S, De Lena M, Uslenghi C. Combination chemotherapy of Hodgkin's disease with adriamycin, bleomycin, vinblastine, and imidazole carboxamide versus MOPP. Cancer. 1975;36(1):252-259. doi:10.1002/1097-0142(197507)36:1<252::AID-CNCR2820360128>3.0.CO;2-7.
13. Depierre A, Lemarie E, Dabouis G, Garnier G, Jacoulet P, Dalphin JC. A phase II study of Navelbine (vinorelbine) in the treatment of non-small-cell lung cancer. Am J Clin Oncol. 1991;14(2):115-119. doi:10.1097/00000421-199104000-00004.
14. Depierre A, Chastang C, Quoix E, Lebeau B, Blanchon F, Paillot N, et al. Vinorelbine versus vinorelbine plus cisplatin in advanced non-small cell lung cancer: a randomized trial. Ann Oncol. 1994;5(1):37-42. doi:10.1093/oxfordjournals.annonc.a058687