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REVIEW

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Anticancer potential of alkaloids: a key emphasis to colchicine, vinblastine, vincristine, vindesine, vinorelbine and vincamine

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Abstract

Cancer, one of the leading illnesses, accounts for about 10 million deaths worldwide. The treatment of cancer includes surgery, chemotherapy, radiation therapy, and drug therapy, along with others, which not only put a tremendous economic effect on patients but also develop drug resistance in patients with time. A significant number of cancer cases can be prevented/treated by implementing evidence-based preventive strategies. Plant-based drugs have evolved as promising preventive chemo options both in developing and developed nations. The secondary plant metabolites such as alkaloids have proven efficacy and acceptability for cancer treatment. Apropos, this review deals with a spectrum of promising alkaloids such as colchicine, vinblastine, vincristine, vindesine, vinorelbine, and vincamine within different domains of comprehensive information on these molecules such as their medical applications (contemporary/traditional), mechanism of antitumor action, and potential scale-up biotechnological studies on an in-vitro scale. The comprehensive information provided in the review will be a valuable resource to develop an effective, affordable, and cost effective cancer management program using these alkaloids.

Keywords: Alkaloids, *Vinca*, *Catharanthus*, *Colchicum*, Anticancer, Microtubule-targeting agents, Antimitotic, Apoptosis

Introduction

Cancer, a rapid formation of abnormal cells in an uncontrolled manner due to various modifications in gene expression, is one of the leading illness-related deaths worldwide [1–3]. In 2020, it accounted for nearly 10 million deaths globally, comprising a major portion of breast cancer > Lung cancer > Colon and rectum cancer > Prostate cancer > Skin cancer > and Stomach cancer related new cases (https://www.who.int/news-room/fact-sheets/detail/cancer). Today, chemically derived drugs treatment along with chemotherapy and radiotherapy constitute different components of cancer treatment, with chemo being adverse to healthy cells [4–6]. A comprehensive treatment of cancer is usually available in 90% of high-income countries, but it is only 15% in low-income countries, thus putting a tremendous economic cost on treatment (WHO, 2020). In 2010 alone, the total economic cost of cancer was estimated to be US$ 1.16 trillion [7]. Nevertheless, many cancers have a high chance of being cured if diagnosed early and treated appropriately [8, 9]. A 30–50% of cancers can be prevented by avoiding risk factors

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