

# Anticancer Drug Derived from Medicinal Plant in India

Pankaj Singh<sup>1</sup>, Manoj Kumar Yadav<sup>2</sup>, Piyush Yadav<sup>3</sup>

<sup>1,2,3</sup>*Department of Pharmacy, Prasad Institute of Technology, Jaunpur*

**Abstract** - Cancer is a major public health burden in both developed and developing countries. It is actually a group of many related cell-related diseases. It is one of the leading causes of death in the world as cancer rates continue to rise. It is a major public problem with its estimated new global events approximately six million cases a year. It is the second leading cause of death after cardiovascular disease. There is always a need for new drugs to treat and prevent this life-threatening disease. The plant kingdom produces second-line naturally occurring metabolites that are being investigated for their anti-cancer activities leading to the development of new therapeutic drugs. Global results continue to identify new anticancer chemicals from plants. In recent years out of fear of side effects, people have chosen to use more natural cancer products. For these reasons, the World Health Organization (WHO) supports the use of effective and non-toxic traditional medicines. This review attempted to summarize a few Indian and Indian plants that have anti-cancer activity.

**Index Terms** - • Medicinal plants; natural products; ayurveda; cancer; alternative medicine

## 1. INTRODUCTION

Anti-cancer drugs can kill cancer cells or alter their growth. However, the choice of many drugs is limited and is one of the most toxic drugs used in treatment. Drug treatment is a recent development that began shortly after 1940 with the use of nitrogen mustard, but progress has been rapid, with the emergence of pathobiology and the discovery of new drugs. Recent art has focused on growth factors. Specific identification methods, angiogenesis, tumor antigens, immune therapies, etc. to introduce a different drug regimen. In addition attempts have been made to define the right combination. Treatment strategies and methods of patient support. Cancer chemotherapy is now an established value and is a very special field that will be managed by oncologists who are supported by a team of various programs. Only standard terms and framework will be presented here. In addition to their

prominent role in leukemia and lymphomas, drugs are used in conjunction with surgery. Radiotherapy and immunotherapy in the combined form of the condition of many solid tumors, especially metastatic.

Chemical toxicity can sometimes be a major problem in the treatment of cancer using allopathy. Various therapies have been developed for the treatment of cancer, many of which use plant-based products. There are four categories of anticancer agents found in plants on the market today, vinca alkaloids (vinblastine, vincristine and vindesine), epipodophyllotoxins (etoposide and teniposide), taxanes (paclitaxel and docetaxel) and Camptothecin derivatives. Plants still have great potential to provide new drugs and are therefore a storehouse of natural chemicals that can provide cancer-fighting chemicals. Recently, Taneja and Qazi have come up with a number of chemical reactions that appear to be effective against cancer plants.

This review will discuss some of the plant products that have recently been tested and may have potential side effects. The effectiveness of such plant products is also discussed

## 2. CATHARANTHUS ROSEUS

Medicinal plants have a long history of use in traditional medicine. Ethno-botanical data on medicinal plants and their use by traditional cultures contribute to the preservation of traditional cultures, biodiversity, community health care and drug development. *Catharanthus roseus* L. (G.) Don, an important medicinal plant of the family Apocynaceae; this plant is a dicotyledonous angiosperm and contains two alkaloids of terpene indole: vinblastine and vincristine used to fight cancer. It is known as antitumour.

The flowers can vary in color from pink to purple and the leaves are arranged in opposite pairs. It produces about 130 alkaloids mainly ajmalicine, vinceine, reserpine, vincristine, vinblastine and raubasin.

Vincristine and vinblastine are used to treat various types of cancer such as Hodgkin's disease, breast cancer, skin cancer and lymphoblastic lempemia.

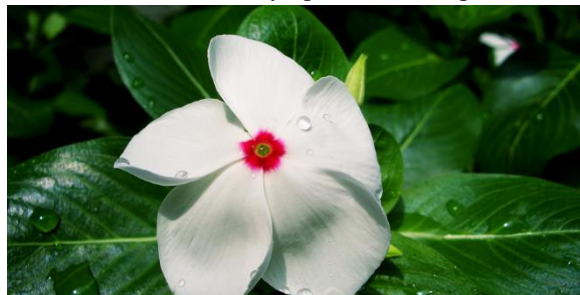


Fig. Catharanthus roseus

Scientific classification:

Botanical Name: Vinca Rosea (Catharanthus roseus)  
 Family Name : Apocynaceae  
 Kingdom : Plantae  
 Division : Magnoliophyta (flowering plants)  
 Class : Magnoliosida (dicotyledons)  
 Order : Gentianales  
 Family : Apocynaceae  
 Genus : Catharanthus  
 Species : C.roseus

Morphology:

Catharanthus roseus is a evergreen shrub or herbaceous plant that grows up to 1 m. length. The leaves are oval in shape to be horizontal, 2.5-9.0 cm. length and 1- 3.5 cm. shiny hairless hair with light brown color and short petiole about 1- 1.8 cm. long and arranged in opposing pairs. The flowers are white to pink with a reddish-black color, with a basal tube about 2.5-3 cm. tall with a corolla about 2-5 cm. five-leaf lobes-wide. The fruit is about 2-4 cm follicles.

Geographical Distribution:

Catharanthus roseus is native to the Indian Ocean Island of Madagascar. In the wild, it is found to be an endangered plant and the main reason for their decline is the destruction of the area by the burning and burning of agriculture however, it is now common in many tropical and subtropical regions of the world, including Southern United.

Potentially Active Chemical Constituent:

Researchers investigating treatment found that it contained a group of alkaloids, although highly toxic, used in the treatment of cancer. Plants have the ability

to combine various chemical compounds used to perform vital biological functions, and to protect them from predators such as insects, fungi and mammals. C. roseus posse's carbohydrate, flavonoid, saponin and alkaloids. Alkaloids are the most potent chemical compounds of Catharanthus roseus. More than 400 alkaloids are present in this plant, used as medicinal plants, agrochemicals, flavors and aromas, ingredients, food additives and pesticides. Alkaloids such as actineo plastidemic, Vinblastine, Vincristine, Vindesine, Vindeline, Tabersonine etc. are mainly found in air compounds and ajmalicine, vinceine, vineamine, raubasin, reserpine, catharanthine etc is present in the roots and stem of the basal. Rosindin is an anthocyanin pigment found in C flower. roseus.

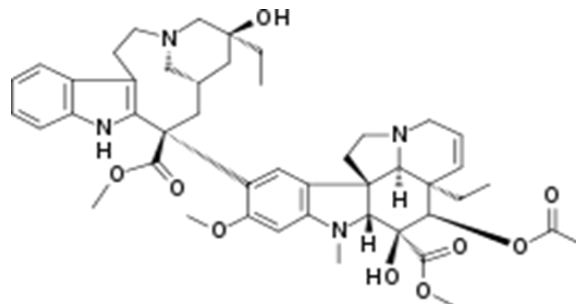


Fig. Vinblastin

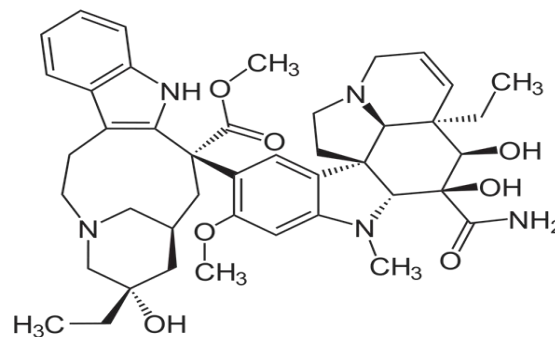


Fig. Vindesine

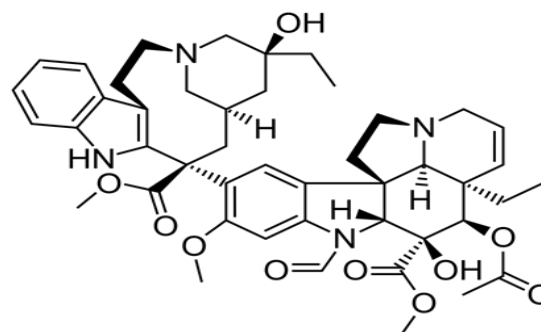


Fig. Vincristine

### 1. Pharmacological Activities:

The anticancer alkaloids Vinblastine and Vincristine are derived from the stem and leaf of *Catharanthus roseus*. These alkaloids have the potential to inhibit the activity of other human tissues. Vinblastine is used to try the treatment of neoplasmas and is recommended for Hodgkins disease, chorio carcinoma. Vincristine is another alkaloids used for leukemia in children. Different percentages of catarant methanolic extraction have been found to show an important anti-cancer activity in many cell types in the in vitro state and the greatest activity has been found in a wide variety of plant plants. Vinblastine is marketed as Velban or Vincristine as oncovin.

### 2. Podophyllum Hexandrum:

The term Podophyllum is derived from ancient Greek words 'Podos' a foot and 'Phyllos' a leaf. Name refers to the resemblance of leaves to duck's foot. Plant is also known as Mayapple because of its fruits ripen in spring.

Podophyllum is represented by three species *P. hexandrum*, *P. Peltatum* and *P. Sikkimensis* but Podophyllum is

Usually represented by two species. *P. hexandrum* is commonly found in the Himalayan regions of the Asian continent and Podophyllum Peltatum is found mainly in the Atlantic North America.

*P. hexandrum* is an important medicinal plant known as the essential drug Podophyllotoxin which contains semi synthetic derivatives etoposide, teniposide and etophos. Podophyllotoxin is very important in its use in the combination of anti-cancer drugs

#### Morphology:

Podophyllum hexandrum is a sturdy, glabrous, and nutritious 35-60cm tall plant with creeping, perennial, knot- shaped insects with many roots.

- Leaves are rounded in outline and deeply cut into three ovate and length of leaves is approximately 10-20cm long.
- The length of Stem is approximately 30-90cm. 2-3 umbrella like, lobed leaves arise on its few stiff branches, they completely unfurl after the plant has bloomed and dark green spotted with brown.

- Flowers: Podophyllum hexandrum flowering period ranges from May to August and it produces white or pale pink flowers during this period flowers are borne at the ends of stout stem and flowers has six petals and six stamens, which inspired its species, name hexandrum meaning six stamens.
- Fruit is n oblong, elliptic berry, 2.5cm to 5.0cm in diameter fruits is red on ripening and containing many seeds embedded in the red pul



Himalayan mayapple

#### Constituent of Podophyllum hexandrum:

- Podophyllotoxin is most important for its use in the synthesis of anti-cancer drugs etoposide teniposide and etophos. These compounds have been used for the treatment of lung and testicular cancers as well as certain leukemia's.
- The mechanism of the action of Podophyllum and its active constituents on tumors in completely understood. It has been found that the necrosis is a direct consequence of cytotoxic effect on tumor tissue, a rapid and marked reduction of the cytochrome oxidase was observed in tumor homogenates from animal treated with the Podophyllum derivatives.

#### Pharmacological Activities:

Methanol, hydro-alcohol and chloroform released by *P. Hexandrum* has been reported to provide about 70-95% of radioprotection in mice when given 1-2 hours before the whole body dies, 10 Gy radiation (Goel et al., 2000; Goel et al., 2001; Goel et al., 2007) *P. hexandrum* contains podophyllin, which has an antimiotic effect. It is used in the treatment of cancer, and especially in the treatment of cervical cancer (Howes, 2001; Board, 2003; Farkya et al., 2004). 4-demethyl- picropodophyllotoxin 7-O-D-glucopyranoside (4DPG) effectively inhibits the growth of cancer cells and inhibits cell cycle in the

mitotic phase. The cytotoxicity of 4DPG is due to its inhibition of the association of microtubules of cancer cells in the lower extremities, including apoptosis. These properties are suitable for 4DPG as an antitumor drug (Qi et al., 2005).

Podophyllotoxin is a natural plant the second metabolite was most present in the P root. Hexandrum

Table1. List of plants has Anti-Cancer activity

		Botanical Name	Part Used	Family	Uses
1	Arjuna Bark	<i>Terminalia arjuna</i>	Bark	Combretaceae	Anticancer
2	Kalmegh	<i>Andrographis paniculata</i>	Dried leaves	Acanthaceae	Anticancer
3	Vinca	<i>Catharanthus roseus</i>	Whole plant	Apocynaceae	Anticancer
4	Ochrosia	<i>Ochrosia elliptica</i>	Trunk Bark	Apocynaceae	Anticancer
5	May Apple	<i>Podophyllum peltatum</i>	Dried Rhizome	Berberidaceae	Anticancer
6	Ginger	<i>Zingiber officinalis</i>	Rhizome	Zingiberaceae	Anticancer
7	Turmeric	<i>Curcuma longa</i>	Rhizome	Zingiberaceae	Anticancer
8	deerberr	<i>Vaccinium stamineum</i>	fruit	Ericaceae	Anticancer
9	Indian mulberry	<i>Morinda citrifolia</i>	fruit	Rubiaceae	Anticancer
10	Bhilwa	<i>Semecarpus anacardium</i>	fruit	Anacardiaceae	Anticancer
11	Madar	<i>Calotrophis gigantea</i>	Whole plant	Asclepiadaceae	Anticancer
12	Arhar Dal	<i>Cajanus cajan</i>	Leaves	Fabaceae	Anticancer
13	Palash	<i>Butea monosperma</i>	Bark	Fabaceae	Anticancer
14	Orchid Tree	<i>Bauhinia variegata</i>	Root	Caesalpinaceae	Anticancer
15	Onion	<i>Alium cepa</i>	Bulb	Liliaceae	Anticancer
16	Indian Aloe	<i>Aloe barbadensis</i>	Leaves	Liliaceae	Anticancer
17	Tarwar	<i>Cassia auriculata</i>	Root	Caesalpinaceae	Anticancer
18	Senna	<i>Cassia senna</i>	Leaves	Caesalpinaceae	Anticancer
19	Lemon	<i>Citrus medica</i>	Root	Rutaceae	Anticancer
20	Carrot	<i>Daucus carota</i>	Root	Apiaceae	Anticancer
21	Danti	<i>Jatropha curcas</i>	Leaves,seed,oils	Euphorbiaceae	Anticancer
22	Mint	<i>Mimosa pudica</i>	Whole plant	Mimosaceae	Anticancer

## CONCLUSION

Any effective solution to control the onset and spread of cancer is very important. The use of herbal products to treat or bind the carcinogenic process provides an alternative to using the common allopathic medicine in the treatment of this disease. Many remedies have been tested in clinical studies and are currently being investigated to understand their tumouricidal properties against various cancers.

Selected and careful use of this plant is also possible in antiangiogenic medicine and thus in the treatment of cancer. Anticancer agents found in plants are inhibitors that work well in cancer cell lines, making them much needed. Exploitation of these agents needs to be managed to suit needs and to be sustainable. A

and also its congeners and derivatives have meant biological activity especially anticancer, antineoplastic and anti-HIV drugs, etc.

Deoxy podophyllotoxin is the main responsible compound for lethal activity on a number of different insect larvae e.g., culex pipiens, Epilachna spara and adult insects such as Blatella germanica.

list has been made that could give an idea of the various types of earth plants that are widely used or under investigation to act as anticancer.

## REFERENCE

- [1] Dharmani P, Kuchibhotla VK, Maurya R, Srivastava S, Sharma S and Palit G. Evaluation of anti-ulcerogenic and ulcer healing properties of *Ocimum sanctum* Linn. *J Ethnopharmacol.* 2004; 93:197-206.
- [2] Dr. Hemamalini Balaji, Versatile. Therapeutic effects of *Vinca rosea* Linn. *International Journal of Pharmaceutical Science and Health Care.* 2014; 1(4):59-

- [3] Boivin JF: Second cancers and other late side effects of cancer treatment. *Cancer* 1990; 65(S3): 770-775.
- [4] Yates JS, Mustian KM, Morrow GR, Gillies LJ, Padmanaban D, Atkins JN, Issell B, Kirshner JJ and Colman LK: Prevalence of complementary and alternative medicine use in cancer patients during treatment, *support care cancer* 2005; 13(10): 806-811.
- [5] Said O, Khalil K, Fulder S and Azaieh H: Ethnopharmacological survey of medicinal herbs in Israel, the Golan Heights and the west bank, *J. Eth. Pharmaco* 2002; 83: 251-265.
- [6] Gupta AK and Tandon N: Reviews on Indian medicinal plants. *Indian Council of Medicinal Research, New Delhi* 2004; 2.
- [7] *Plants Diseases*; By R.S. Singh, II Edition, Published by Oxford & IBH Publishing Company, New Delhi.
- [8] *Encyclopedia Of Common Natural Ingredients Used in Food, Drugs & Cosmetics*; By Alborn Y. Lewng, Consultant, Natural Products, Glen Rauk, New Jersey.
- [9] *Trease & Evans Pharmacognosy*; By Williams Charles Ewans, 14 Edition, Published by Harcourt brace & Company Asia Pvt. Ltd.
- [10] *Spices*; By Henry N. Ridely, Published By International Book Distribution, Dehradun, Reprint 1983.