



**Review Article**

**ANTI-CANCEROUS DRUGS IN AYURVEDA- RESEARCH REVIEW**

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**ABSTRACT**

Cancer is one of the major contributing factors for the increase in the mortality rate in our country. The most agonizing concern regarding cancer is the emotional and physical suffering that a patient undergoes. The pathology of cancer includes several steps. The pathology has to be understood clearly to evolve an effective management. Even though, many advanced anti-cancerous treatment modalities are in practice, the side effects encountered by them are forcing the mankind to look for an alternative system of medicine either as direct treatment or as a support to the modern treatment modalities. At this context, Ayurveda has a definite role to play in this scenario. Certain Ayurvedic drugs which act as regulators of growth factors, Signal transcription and transduction proteins, Cell cycle regulators, anti-proliferatives, Apoptosis inducers, angiogenesis inhibitors, anti- invasive and anti- metastatic have shown to have a very good effect on the arrest of cancer at various stages. Many latest researches had identified and confirmed the utility of Ayurvedic drugs in various cancers. Chemotherapy and radiation therapy which are the only choice of treatment in most of the cancers are encountered with numerous side effects. Natural radio protectors which have a higher therapeutic potency with reduced or minimum toxicity are the need of the hour. A few of these were also found to be chemo-protectors and radio protectors. Many drugs like *Curcuma longa*, *Crocus sativus*, *Commiphora mukul* and the like which were proven to have anti-cancerous properties, natural radio protectors and natural dietary supplements are listed and discussed in this paper.

**KEYWORDS:** Cancer, Pathology, Apoptosis, Anti-cancerous drugs, Chemo-protectors, Natural radio protectors.

**INTRODUCTION**

Cancer is one of the leading causes of death in India. Malignant tumors are collectively referred to as Cancers. Cancer is derived from the term “Crab” because they adhere to any part that they seize in an obstinate manner, similar to a Crab. [1]

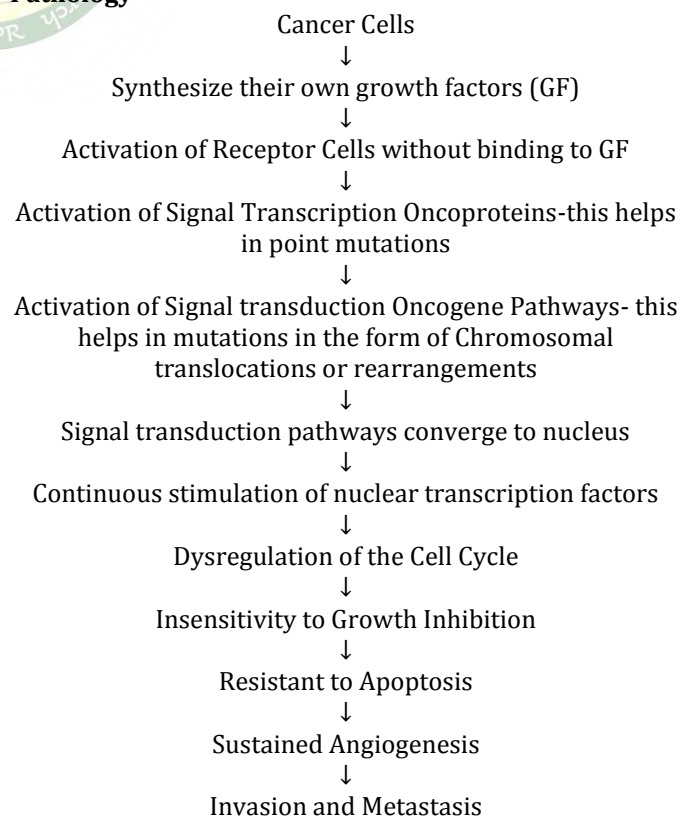
The Pathology of cancer includes multiple factors and multi systems. To achieve a successful treatment, pathology should be understood clearly. Hence, Pathology is also discussed here to evolve an effective treatment. The present treatment modalities of cancer are unable to prevent the many side effects which are highly disgusting to the patients rather than the disease itself. Hence, an effective system of medicine which provides a solution to the cancer, its complications, and the side effects of the present treatment modalities is the need of the Hour. Ayurveda blesses the modern World with several drugs which act at different stages of the progression of cancer and provide a good positive health in a more natural way by increasing the immunity of the patient.

**Aims & Objectives:** To list out certain Ayurvedic drugs which were proven to be anti-cancerous by various researches.

**Materials & Methods:** Various Samhitas, modern medical text books and websites.

**Discussion:** There are certain essentialities in the Pathogenesis of Cancer.[2]

**Pathology**



**Management:** For a successful management drugs which act at each stage of the above pathology are essential. Hence, the management should aim at.

1. Regulation of GF and GFR.
2. Regulation of Signal transcription proteins.
3. Regulation of Signal transduction proteins.
4. Cell Cycle Regulation.
5. Anti-proliferation.
6. Growth Inhibition.
7. Induction of Apoptosis.
8. Inhibition of Angiogenesis
9. Prevention of Invasion and Metastasis

Certain Ayurvedic drugs which acts at the above stages and were proved to be anti-cancerous are listed below:

#### 1. Regulation of GF and GFR

Malignant cells synthesize their own growth factors (GF) which are over expressive in their action. In a normal healthy cell the growth factors come from a neighbouring cell which aid in cell proliferation. So, regulation of the growth factors is the initial step in the management of cancer.

*Kiratatika – Andrographis paniculata.*

*Andrographis paniculata* when worked upon epidermoid Carcinoma cells had down regulated the epidermal growth factors and epidermal growth factor receptors on the cell surface and thereby induced cancer cell death.<sup>[3]</sup>

#### 2. Regulation of Signal transduction proteins

Signal transduction proteins help in the transmission of the signals from the growth factor receptors to the nucleus in a normal cell. In a carcinomatous cell there is an excessive activation of signal transduction oncoproteins. They help in point mutation and translocations. Drugs which regulate activity of signal transduction oncoproteins are essential.

*Karavellaka – Momordica charantia.*

The research done on human breast cancer cells showed that *Momordica charantia* extract inhibited cell proliferation by modulating signal transduction pathways and promoting Apoptosis.<sup>[4]</sup>

#### 3. Regulation of Signal transcription proteins

In a eukaryotic cell the transcription proteins initiate DNA transcription in a regulated manner. In a cancer cell continuous stimulation of transcription proteins in an unregulated manner leads to mutations through translocation or amplification.

*Aswagandha – Withania somnifera*

The research done on human breast cancer cells showed that *Withania somnifera* inhibits constitutive as well as interleukin – 6 inducible activation of signal transducer and signal transcription proteins.<sup>[5]</sup>

#### 4. Regulation of Cell Cycle

Cell cycle regulation is done by Cyclin and Cyclin Dependent Kinase proteins in a normal cell. In a carcinogenic cell there is a complete dysregulation of the activity of Cyclins and Cyclin Dependant Kinase. Hence, the cell cycle becomes non-regulatory.

Regulation of cell cycle is one of the essentialities of cancer management.

*Haridra – Curcuma longa.*

All the pathological factors described above are essential for a regulated cell cycle. Hence all the above drugs may play a vital role in the regulation of cell cycle. Curcumin, a naturally occurring polyphenol compound found in the plant *Curcuma longa*, is used as an Indian spice. It regulates not only the various pathways of the immune system, cell cycle checkpoints, apoptosis, and antioxidant response but also numerous intracellular targets, including pathways and protein molecules controlling tumor progression.<sup>[6]</sup>

#### 5. Anti-proliferation

In a normal cell proliferation takes place in a regulated manner due to regulated cell cycle. In a cancer cell as the cell cycle is not in a regular manner, the cell proliferates at a very high active stage. Anti-proliferative drugs are to be used in the management of cancer.

*Moolaka – Raphanus sativus.*

Research on human cancer cells showed that *Raphanus sativus* inhibits cell proliferation and induces Apoptosis by modulating Genes related to Apoptotic pathway.<sup>[7]</sup>

#### 6. Growth inhibition

In a normal cell, growth of the cell is inhibited by cell cycle arrest. In a malignant cell the cell becomes insensitive to growth inhibition as they become insensitive to tumour suppressor genes.

*Nimba – Azadirachta indica.*

A study on human cervical cancer cells showed that *Azadirachta indica* induce cell cycle arrest at G0/G1 phase and there by induces growth inhibition.<sup>[8]</sup>

#### 7. Apoptosis induction

Apoptosis is programmed cell death. In an eukaryotic cell the cell death occurs in a programmed manner. A cancer cell becomes highly resistant to apoptosis and so there is no cell death. The drugs that induce cell death by acting at different stages of the cell cycle are essential in the management of cancer.

*Lasuna- Allium sativum*

A study on human colon cancer cells showed that *Allium sativum* induces apoptosis in cancer cells via Nrf2.<sup>[9]</sup>

#### 8. Sustained angio-genesis

Rich blood supply is essential for the cell to grow. If the cell is receiving the blood supply beyond a certain limit then it is naturally cut off in a normal cell. In a malignant cell there is continuous blood supply i.e. sustained angiogenesis and so the cell will be developing continuously. The drugs which inhibit angiogenesis have a definite role to play in the management of malignancy.

*Guggulu - Commiphora mukul*

A research on colon cancer cells have shown that the guggul sterone inhibits angiogenesis by blocking Stat3 and VEG F signaling pathways.<sup>[10]</sup>

## 9. Prevention of Invasion and Metastasis

Normal cell do not attack the neighbouring cells. Hence, there is no invasion and metastasis. Cancerous cells are highly active, invade the neighbouring cells and also they go and settle at different sites. The drugs which help in the prevention of invasion and metastasis are highly essential in the management of cancer.

### *Kiratatikta – Andrographis paniculata*

Research on human non-small cell lung cancer A 549 cells had shown that andrographolide had an inhibitory effect by down regulation of P 13 K /AKT signaling pathway. It also had an inhibition on MMP-7 which led to reduced invasiveness of cancer cells.<sup>[11]</sup>

The choice of treatment in the western medicine is either surgery or surgery with chemotherapy or surgery with chemotherapy and radiation therapy. Chemotherapy drugs are powerful enough to kill the rapidly growing cancer cells but they also can harm the perfect healthy cells causing side effects throughout the body. The drugs that can effectively fight against cancer without harming the healthy cells play a pivot role in the management of cancer. Ayurvedic drugs enlisted above can be an answer to the quest of natural anti-cancerous drugs.

## Natural Radio Protectors

Radio protectors reduce the effects of radiation in healthy tissues and at the same time maintain the sensitivity of cancer cells to the ill effects caused by radiation. Rapid increase in the modern technology had let the world know about the toxic effects of radiation therapy and also increased awareness about the cancer therapies. Now the modern world is in a deep quest for the search of natural radio protectors. Natural radio protectors act at different level to reduce the toxic effects of radiation therapy. Hence, natural radio protectors are the need of the hour.

## Mechanism of the action of natural radio protectors<sup>[12]</sup>

- Anti oxidant mechanism i.e. scavenging of free radicals.
- Augmenting cellular radio protectors as prostaglandins, Super oxide Dismutase and Glutathione.
- Promotes the recovery of haematopoietic and immune functions.
- Compaction of DNA
- Triggering the DNA repair enzymes
- Delay of cellular division and inducing hypoxia in the tissues.

Ayurveda is a boon to the mankind which flourishes with certain drugs possessing natural radio protective property.

### 1. *Satavari – Asparagus racemosus*

A research on rat liver had shown that *Satavari* efficiently protects proteins, DNA and lipids in rat liver

mitochondria against gama –ray induced damages.<sup>[13]</sup> So it can be used as a natural radio protector.

### 2. *Guduchi – Tinospora cordifolia*

The antioxidant activity of an arabinogalactan polysaccharide (TSP) isolated from *Tinospora cordifolia*, showed good protective action that can possibly be explained by its very high reactivity towards superoxide radicals and the most damaging of radicals, the hydroxyl radical.<sup>[14]</sup> This shows the scavenging property of *Guduchi* which gives it a place in natural radio protectors.

### 3. *Tamala - Piper betel*

A study on the ethanolic extract of Piper betel on rat liver and DNA had shown good radio protective activity due to its radical scavenging capacity. The radical scavenging capacity of PE was primarily due to its constituent phenolics, which were isolated and identified as chevibetol and allyl pyrocatechol.<sup>[15]</sup>

- Brahma rasayana, Narasimha rasayana* and *Aswagandha rasayana* – a study on the above classical preparations have shown that they are good radio protectors of mice against lethal effects of ionizing radiation. These *Rasayanas* have shown to promote recovery of bone marrow cells as well as immunological functions.<sup>[16]</sup>

Most of the natural radio protectors are proven to have anti-oxidant property that helps in the scavenging of free radicals. This is the most important action that aided to list them as natural radio protectors. Hence, our natural radio protectors are proven to have a higher prophylactic and therapeutic potency with reduced toxicity. Moreover they have an advantage over the synthetic compounds as they have minimum toxicity and side effects.

Ayurveda has many drugs which can be used as natural dietary supplements for cancer chemo prevention. Herbs and spices have been used as a part and parcel of the Indian diet since ages. These natural supplements can be used in the fight to prevent the onset or delay the progression of the carcinogenic process. They can be used as an adjuvant agent along with standard anti-cancer agents. Drugs like *Haridra, Ardhraka, Sarshapa, Ela* and *Kesar* have shown to possess anti-microbial and chemo preventive properties.<sup>[17]</sup>

As Hippocrates stated let our food be our medicine. Investing in our food is the smallest investment of all. So let us eat food with medicinal effects to meet our health conditions.

## CONCLUSION

Cancer is one of the most disgusting diseases as the victims suffer both from ill health as well as the side effects of the treatment modalities that are prevailing in the modern world. The aim of cancer management should be not only the disease but also the toxic effects of the management therapies. Ayurveda has a definite role to play and be a ray of hope for many of the cancer victims. Many drugs that are enlisted in our classical textbooks have proven to be anti-cancerous as per the modern researches. Further research in this field may bring out

many more drugs and treatment modalities which is the necessity of the present day. These natural agents can also be very effectively used as an adjuvant agent along with standard anti-cancerous agents. All systems of medicine should work together to fight cancer in a more effective manner. This review enlists certain Ayurvedic drugs having anti-cancerous and radio protective properties. Food is given much importance in Ayurveda in the form of *Pathya-apathya*. A few drugs which can be used as natural dietary supplements are also discussed.

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