

PREVANTION OF CANCER THROUGH AYURVEDA**Vd. Sneha Kishor Gujarathi^{1*} and Vd. Smita Vitthal Lokhande²**

¹MD Scholar, Kayachikitsa Annasaheb Dange Ayurved Medical College, Ashta, Tal-Walwa,
Dist-Sangli, Maharashtra. 416301.

²MD, Kayachikitsa Kayachikitsa Department Annasaheb Dange Ayurved Medical College,
Ashta, Tal-Walwa, Dist-Sangli, Maharashtra. 416301.

Article Received on
22 September 2023,

Revised on 12 Oct. 2023,
Accepted on 01 Nov. 2023

DOI: 10.20959/wjpr202319-30221

***Corresponding Author**

**Vd. Sneha Kishor
Gujarathi**

MD Scholar, Kayachikitsa
Annasaheb Dange Ayurved
Medical College, Ashta,
Tal-Walwa, Dist-Sangli,
Maharashtra. 416301.

ABSTRACT

Cancer is a complex, multifaceted group of diseases characterized by the uncontrolled growth and spread of abnormal cells throughout the body. It is one of the leading causes of death worldwide and poses major challenges to public health, medicine and society as a whole. Ayurveda can be helpful in preventing, alleviating, treating and supporting cancer in various ways. It can be used in combination with chemotherapy or radiation therapy as adjuvant or combination therapy. Ayurvedic treatment minimizes the toxicity of chemotherapy and radiation therapy. The science of Ayurveda is expected to make a breakthrough in the medical aspects of cancer similar to the clinical entities of Arbuda and Granthi mentioned in the Susrutha Samhita. Ayurveda has mentioned various lifestyle-related carcinogens. It is a disease of disturbed life style, change in food habits, and

environmental pollution are among the chief causes of Cancer in most cancer cases. Aahar Vihar plays a crucial role especially in ancient healing methods and theories. This paper explore the concepts of cancer mentioned in Ayurveda also examines the scope of plant drugs used in the treatment of cancer.

KEYWORDS: *Arbuda, Granthi, Aahar, Vihar.*

INTRODUCTION

Cancer is one of the deadly challenges spreading in 21st century. 15 million new cases of Cancer and 10 million deaths out of Cancer by 2020 AD. The most commonly diagnosed cancers worldwide were those of the lung (1.8 million, 13.0% of the total), breast (1.7

million, 11.9%), and colo-rectum (1.4 million, 9.7%). The most common causes of cancer death were cancers of the lung (1.6 million, 19.4% of the total), liver (0.8 million, 9.1%), and stomach (0.7 million, 8.8%). Depending on the stage of the tumor, the most common treatments are surgery, radiation therapy and chemotherapy. However, the downside of radiation therapy and chemotherapy is the development of temporary and permanent treatment-related side effects, ranging from hair loss to lung or nerve damage. Dry mouth, mouth ulcers, difficulty or pain in swallowing, nausea, vomiting, diarrhea, constipation, fatigue, bleeding and loss of appetite, etc. are also inevitable. The maximum cancer drugs approved by the FDA are inherently toxic, immunosuppressive, and carcinogenic. Therefore, Ayurvedic medicines can be useful in addition to modern medicine and can also be administered alone for complete healing.^[1,2] Research suggests that bioactive phytochemicals found in Ayurvedic plants (fruits, vegetables and herbs) blunt their effects by inhibiting some recently identified inflammatory pathways.

Nidana of Arbuda

Ayurveda says, that the disturbance of three doshas (Vata, Pitta and Kapha) is the main cause of all diseases. Many factors are responsible for the alleviation of these three doshas, the most important of which are.

1. Poor diet (food before digesting the previous food or not consuming food while hungry), sleep disorders (waking up at night and sleeping during the day), suppression of natural urges (stool, urine, hunger, thirst, etc.), lack of exercise and mental limitations such as anxiety, tension, stress, depression, etc. make the mind more unstable, which creates an imbalance and leads to a higher incidence of cancer.

Literary review on Arbuda

in Ayurveda, Charak Samhita and Sushrut samhita they describe ARBUDA which is resemblance to cancer which described as an inflammatory or non-inflammatory swelling and classify it as Granthi (small Neoplasms) or Arbuda (large Neoplasms).^[3,4]

On the other hand, the literary significance of Arbuda is solid or massive. described by Sushrut^[5], Arbudas gradually enlarge and become large, spherical, with a deeper structure, usually do not fester, occasionally cause pain, and can appear anywhere on the body. According to sushruta mainly Kapha causes arbuda^[6] Irritation caused by elevated Dosha^[7] causes trauma^[8] can accelerate or activate the formation of Arbuda It can affect Mamsa and

Rakta dhatu. According to Sushruta, trauma is also considered another causal factor in the development of Mamsarbuda. Vagbhatta also mentioned that large granthis are called arbuda (malignant tumors); There are six types caused by doshas etc. Due to the predominance of Medas (fat) and Kapha in general and their deep roots, they do not mature (abscess).^[9] This indicates that Mithya Vihara probably changes local or systematic bio chemical factors including the haemo-dynamics^[10] leading to the origin of Arbuda.

Sushruta proposed six stages in the pathogenesis

This is applicable for all diseases, but his concept corresponds more to the pathology of cancer than to the pathogenesis itself.

1. Sanchaya: Early stages of localized cancerous lesions.
2. Prakopa: Transformation of primary growths into metastatic tumors.
3. Spread: metastasis.
4. Sthana samsraya: metastasis and secondary growth.
5. Vyakti: Clinical features are expressed. 6. Bheda: The stage at which growth differentiation occurs based on histopathology.^[11]

The three forms of metastasis

Sushruta describes three forms of metastasis.

1. Raktarbuda: when the tumor is surrounded by smaller tumors.
2. Adhyarbuda: formation of another tumor in place of the first tumor or when a tumor occurs in a pre-existing location.
3. Dviarbuda: when two tumors occur at the same time. tumors causing excessive secretion of fluid in the surrounding tissue, located in vital locations or channels (lymphatic system and blood vessel system), tenaciously attached to the surrounding tissues are difficult to cure.^[12]

Principles of Ayurvedic treatment

The Ayurvedic system of medicine is well based on the basic principles of nature and its elements after careful and careful study of human physiology. It is the first system to emphasize health as the perfect physical, mental, social and spiritual state of a person. Ayurvedic therapy is to find the cause of the disease.

The therapeutic approach of Ayurveda has been divided into four categories.

1. Prakritisthapani Chikitsa (maintenance of health),
2. Roganashani Chikitsa (treatment of diseases),

3. Rasayana Chikitsa (restoration of normal functioning)

4. Naishthiki Chikitsa (spiritual approach).^[13]

Surgery is only considered in advanced cases.

Prakritisthapani Chikitsa

In prakritisthapani chikitsa the main approach is to maintain a normal state of vata, Pitta and Kapha It achieve by following Dincharya and Ritucharya (daily routine).

Dincharya

It include,

1. Yoga (exercise),
2. Abhyanga (massage)
3. Snana (bath),
4. Meditation
5. A proper healthy diet (aahar),
6. deep sleep (nidra), etc.
7. Dantadhavana teeth cleaning early in the morning with herbs which are Kashaya – Tikta – Katu Rasatmaka. Since these rasas are Kaphahara and Keldaghna, they help calm the Kapha dosha.
8. Anjana – Usa Sauveeranjana & Rasanjana is recommended to maintain eye health.
9. Dhoomapana
10. Gandusha – Dhoomapana is mainly displayed in Kaphavata Avastha da Katu – Tikta Kashaya Rasa Dravya.
11. Abhyanga - If you use daily Abhyanga. 12Udvardhana –it is the external application of churna which is katu tikta rasatmaka does medoghna activity.
13. Vyayama - Vyayama should be done as Ardhashakti.
14. Snana – Snana vata shamana activity relieves stiffness.^[14]

Ritucharya

Tridoshas Vata, Pitta and Kapha in our body changes according to the changes in Ritu. if diet and habits is not changed according to ritu then, it leads to imbalance of dhoshas and development of disease takes place. It is important to early diagnosis and prognosis of any diseasea, and to line out the preventive and Theraputic measures. Ritu is the Naimmitya karana of any disease. So it is important to change lifestyles and diet according to ritu to preserve Equilibrium of tridoshas.^[15]

Roganashani Chikitsa

The Ayurvedic herbs and there formulations are used in Roganashini chikitsa.

Rasayana Chikitsa

In the Chikitsastana Rasayanadhya of Charak Samhita, the concept of the Aachara Rasayana is explained, It referes to the practise of maintain mental hygiene.

Naishthiki Chikitsa

It suggest Spiritual approach. Improving quality and strength of mind so that one attains a state of supreme and eternal happiness.

Types of Arbuda**i) Types of Arbuda according to Dosha.**

1. Vataja Arbuda
2. Pittaja Arbuda
3. Kaphaja Arbuda
4. Tridoshaja Arbuda

ii)Types of Arbuda according to Dhatu (tissue or cells)

It shows that ancient Indian clinicians were aware of the tissue involvement as the local factor. Dhatus is included in Arbuda, i.e., in three types of dhatus, according to the description of Sushruta in Nidana Sthana.

1. Raktaja Arbuda –Pitta predominance.
2. Mamsaja Arbuda- Vatika predominance, sarcoma is considered as Mamsaja Arbuda.
3. Medoja Arbuda (Fatty tissue) However, there is also a clear description of where Asthi (Bone) also causes swelling like 'Adhyasthi,' but not like Asthyarbuda. Further Asthikshaya may also be included with Asthyarbuda if it is located in a specific portion similar to pathological fractures or bone destructive osteoclastic change.

iii) Types of Arbuda according to sites

The Arbuda may be present at any place or body tissue, according to Sushruta, and probably no place that cannot lead to Arbuda may be exempt. Their eyes, ears, nose, oral cavity are separately, for example, Vartma-Arbuda (eye lid), Karnarbuda (ear), Taluarbuda (Palate), Ostharbuda (Lip), Throat, Mukharbuda (Buckling mucous) and Sirarbuda (Head or Hirst tumors). This includes eyes (or ear), nose or nose. In addition to the above site, the genital

organ was also included as "Shuka Dosha." This covers two Arbuda types, i.e. precepted by the misuse of various kinds of 'Linga Vriddhikara Yoga' by Mamsarbuda and Shonitarbuda.

iv) Types of Arbuda according to prognosis.

It Based on the prognosis of the different types of Arbudas described in Ayurvedic text books, they can be placed under two categories.

Sadhya (Curable).

Arbudas are also called Sadhya, the most likely cyst benign tumors or inflammatory inflammation.

2. Asadhya (incurable)

are considered to be most of the Arbudas, including Mamsarbuda, Raktarbuda, and Tridoshaja arbuda from any location in ear, nose, throat etc.

Ayurvedic Cancer Treatment^[16]

Since ancient times, cases of cancer have been treated with Ayurvedic herbs. Many recent studies suggest that Ayurvedic herbs and their components mediate their effects by modulating many of the recently identified therapeutic targets mentioned above. However, the molecular basis of the effect of Ayurvedic medicines on cancer can be explained by the following aspects.

1. Anti-angiogenesis - It is a form of targeted therapy in which drugs or other substances are used to stop the growth of cancer. new blood vessels. Without blood supply the tumor cannot grow.(Angiogenesis – Formation of blood vessels.)
2. Apoptosis – Means programmed cell death. Tumor cells have a suicidal tendency. Ayurvedic medicines trigger the process of apoptosis in cancer cells.
3. Destruction of stem cells - Ayurvedic medications destroy cancer stem cells and thus prevent metastasis. Ayurvedic medicines also have a significant impact on complications arising from chemotherapy and radiation therapy. Complications of cancer treatment which include nausea, decreased appetite, hair loss, hypersalivation, pleural effusion, pericardial effusion, ascites, weight loss, sexual dysfunction, anxiety, depression, fatigue, liver and Kidney disease. Ayurvedic medicines improve nutritional status and effectively combat complications. Therefore, Ayurvedic medicines can be prescribed along with chemotherapy and radiotherapy to get better results. Ayurvedic medicines which can calm of all three doshas are very useful for cancer patients. To achieve optimal results, it is necessary to simultaneously administer some hepatoprotective drugs that are specifically tailored to the

diseased organs. Considering these parameters, Ayurvedic Medicines for Cancer are as follows.

1. Tridoshasamak medicines: Medicines that can pacify all three doshas include Triphala, Guduchi (*Tinospora cordifolia*) and Yashtimadhu (*Glycyrrhiza glabra*).

i) Triphala

It is a traditional Ayurvedic herbal preparation consisting of equal parts of three medicinal plants namely *Embolia officinalis*, *Terminalia chebula* and *Terminalia belerica*. Triphala. Triphala shows immunomodulatory properties which improves body defence system. Triphala scavenges free radicle which inhibits radiation induced lipid peroxidation and strand break in plasmid DNA and shows radioprotective activity caused due to radio therapy in cancer. It also have Antioxidant activity and its acetone extract exhibits significant cytotoxic effect on cancer cell.^[17]

ii) Guduchi (*Tinospora cordifolia*)

Guduchi rebalances Tridosha (Vata, Pitta), Kapha), helps to increase the body's defense mechanism (immune system). A study conducted on *Tinospora cordifolia* suggests that *Tinospora cordifolia* extract has anticancer potential in mice using a two-stage skin carcinogenesis model the study shows that tumor is significant reduced along with significant elevation of phase II detoxifying enzymes, and inhibition of lipid peroxidation in liver and skin.^[18]

iii) Yashtimadhu (*Glycyrrhiza glabra*)

The side effect like mucositis, skin reaction etc are seen in patients who receiving Chemotherapy and Radiation therapy in head and neck malignancies . A study was done to prevent mucositis in patient who receiving chemo and radiotherapies. In this study the Yashtimadhu powder with honey was used for local application along with yashtimadhu ghruta. The results shows reduction in mucositis in great extent so yashtimadhu used in prevention of mucositis in post radiation and chemotherapy.^[19]

2. Specific organs: Medications that act on specific organs affected by cancer must be prescribed. For example: medicines can be classified as follows.

i) Liver Cancer**Kalmegha:** (*Andrographis paniculata*)

It is antidote for hepatotoxins it contains Andrographolide shows cytotoxic activity against a variety of cancer cell.^[20]

Kakamachi: (*Sonchum oleraceum*)

it is hepatoprotective the fruit extract could be used as an antioxidant in cancer chemoprotective material. Glycoprotein contains anticancer properties.^[21]

Bhumyamalaki (*Phyllanthus niruri*)

It is an important liver protecting Ayurvedic herb because of its antioxidant properties.

Its antioxidant properties shows significant decrease in plasma LOP and increase in plasma vit C, uric acid, GSH level.^[22]

ii) Lung Cancer**Vasa** (*Adhatoda vasica*)

vasica contain ketone, terpene, and phenolic ether which have antitumor, antioxidant, antiaging, antimutation, and sedative effects.^[23]

Kantakari (*Solanum Xanthocarpum*)

Oxidative stress induces a cellular redox imbalance which has been observed in various cancer cells. Polyphenols have been shown to inhibit the cancer associated enzyme telomerase, cell cycle and induce apoptosis.^[24]

iii) Cervical Cancer

Plumbago Zeylanica it has anti cancer and anti metastatic effect which forms cytotoxicity effect against cervical cell.^[25]

iv) Breast cancer**Matulunga** (*Citrus medica*)

The flavonoids and limonoids contained in citrus fruits are believed to be the origin of their antitumor and anti-inflammatory effects.^[26]

Haridra (*Curcuma longa*)

The effect of curcumin has been examined at various stages of cancer development.^[27]

V) Colon cancer

1. Bilwa (*Aegle marmelos*)

The presence of antioxidant components such as β -carotene, glutathione, β -tocopherol, ascorbic acid, total polyphenols, and flavonoids contributes to Bael's antioxidant properties. marmelin extracted from Bael exhibits anticancer properties against human colon cancer (HCT-116).^[28]

2. Ginger (*Zingiber officinalis*)

Ginger contain glutathione which is ROS, reducing lipid peroxidation and ginger it also contain 6-gingerol and 6-shogaol have shown antiinflammatory property also suppress tumor growth.^[29]

3. Maricha (*Piper nigrum*)

Piperine, a piperidine alkaloid present in black pepper, inhibits the growth of cancer cells.^[30]

vi) Prostate Cancer

1. Guggulu (*Commiphora mukul*)

Gugulipid (GL), extract of Indian Ayurvedic medicinal plant *Commiphora mukul*, has been used to treat a variety of ailments. We report an anticancer effect and mechanism of GL against human prostate cancer cells.^[31]

2. Salmali (*Bombax malabarica*)

It significantly increases the number of neutrophils involved in cell-mediated immunity and activates T cells to release several lymphokines. This attracts macrophages, induces vasodilation, and prevents inflammation.^[32]

Role of diet, sleep and exercise in cancer treatment^{[33][34]}

In Ayurveda, Ahara (food), Nidra (sleep) and Brahmacharya (celibacy) are considered the Traya Upastambha (tripod) of life. To maintain a healthy life, special precautions should be taken while eating, sleeping and performing brahmacharya. Poor eating habits, obesity, sleep disorders and physical inactivity account for approximately 30-35% of cancer deaths. Physical inactivity is thought to increase the risk of cancer not only by affecting body weight, but also by negatively impacting the immune and hormonal systems. A diet low in vegetables, fruits, and whole grains and high in processed or red meat has been linked to many types of cancer. A diet high in salt has been linked to stomach cancer, aflatoxin B1, a common food

contaminant, liver cancer, tobacco use, oral cancer, alcohol consumption, liver cancer and red meat, or has had an impact on breast, colon and pancreatic cancer. Taking into account the above, Ayurvedic recommendations are as follows.

1. Eat fruits, vegetables and multigrains.
 2. Consume as much cow ghee, cow milk and goat/camel milk as possible.
 3. Avoid fried, spicy, fast food, junk and canned foods.
 4. Avoid non-vegetarian products, especially red meat once a week, even in growing children. Prefers to cook fresh fish, poultry, alternative protein sources (soy, eggs, dairy) and organic red meat.
 5. Vitamin D protects against the development of cancer. Oily fish, eggs and vegetable oils are natural sources of vitamin D.
 6. Many people think that sugar is not the problem. Sugar does not feed the tumor. However, this can lead to obesity or hyperactivity.
 7. Avoid incompatible foods, e.g. Milk with unripe fruits, milk with vegetables etc.
 8. Use Agnivardhak medicines like Trikatu (Sounth, Marich and Pippali) along with food to improve metabolism.
 9. Tridoshamaka medicines like Triphala, Dasamoola, Guduchi etc.
 10. Drink lots of water.
 11. Avoid consumption of tobacco, alcohol and other intoxicants.
 12. Ensure proper drainage of feces and urine.
 13. Do not overeat or consume food before the previous one has been digested.
- with factors.

DISCUSSION

Ayurveda says that the main cause of Cancer disease formation is imbalance of Tridosha i.e Vata, Pitta, Kapha according to Ayurveda. The imbalance of dosha is mainly caused by mithya ahar vihara, viruddhahar, Vishnashana (irregular diet habits and unhealthy diet), Adhyashana (eating food before digestion) which causes vitiation of doshas. In case of Cancer mainly Kapha Dosha is elevated according to Shushruta. In Ayurveda many medicinal herbs have great potential in treating cancer to keep doshas balanced. They possess Antimutation, Antiaging, Antiinflammatory Antioxidant, Antitumor properties and also reduce the side effects of Chemotherapy and Radiation therapy. Aahar (diet) and Dinacharya (lifestyle) helps to maintain a healthy body, which in itself can reduce the risk of many cancers.

CONCLUSION

Ayurvedic treatment, along with internal treatments such as herbal remedies, dietary changes, spiritual support and adoption of the lifestyle described in the Ayurvedic classics, can provide new hope in cancer treatment and prevention. It helps to reduce side effect of Chemo and Radiation therapy. Therefore, Ayurvedic treatment can be used as supportive treatment along with these therapies and also administrated alone to get complete relief to Patient.

REFERENCES

1. Nathan DG. The Cancer Treatment Revolution: How Smart Drugs and Other New Therapies Are Renewing Our Hope and Changing the Face of Medicine. John Wiley & Sons, Hobokon New Jersey, 2007.
2. Roland TS, Khleif S. Handbook of Cancer Chemotherapy. Lippincott Williams & Wilkins, Philadephia, 2007.
3. Sharma P V. Charaka Samhita. Varanasi: Choukhamba Orientalia, 1981.
4. Bhishagratha KL. Sushruta Samhita. Varanasi: Choukhamba Orientalia, 1991.
5. Maharishi Sushruta, Sushruta Samhita parts I, Nidana Sthana, Granthi apache arbuda galganda Nidana Adhyaya, 11/10, Edited by Ambikadatta Shastri, Chaukhamba Sanskrit Sansthan, Varanasi. Reprint, 2007; 272.
6. Ibidem Sushruta Samhita (18), Granthiapachiarbudagalganda Nidana Adhyaya, 11/22; 274.
7. Ibidem Sushruta Samhita (18), Granthiapachiarbudagalganda Nidana Adhyaya, 11/22; 272.
8. Ibidem Sushruta Samhita (18), Granthiapachiarbudagalganda Nidana Adhyaya, 11/22; 278.
9. Prof. K.R. Srikantha Murthy, Vagbhata's Ashtanga hridayam, Vol. III, Uttara Sthana, Granthi Arbuda Sleepada Apachi Nadi Vijnaniya, 29/15 Chaukhambha Krishnadas Academy, Reprint, 2014; 277.
10. Ibidem Sushruta Samhita (18), Granthi apache arbuda galganda Nidana Adhyaya, 11/16; 273.
11. Sastry JLN. Introduction to oncology, cancer in Ayurveda. Varanasi: Chaukhambha orientalia, 2001; p. 1–24.
12. G. C. Prasad, Manoranjan Sahuand P. J. Deshpande, Concept of cancer in Ayurveda, Ancient Science of Life, Vol No. I No.3 January 1982; Pages 172–176.
13. Thatte U, Dhahanukar S. Ayurveda, the natural alternative. Sci Today, 1991; 2001: 12–8.

14. Sharma PV. Charaka Samhita. Varanasi: Choukhamba Orientalia, 1985.
15. Sharma PV. Charaka Samhita. Varanasi: Choukhamba Orientalia, 1985.
16. Premalatha Balachandran, Rajgopal Govindarajan. Cancer—an ayurvedic perspective; Pharmacological Research, 2005; 51: 19–30.
17. Juss SS, Triphala – the wonder drug. Indian Med Gaz, 1997; 131: 194-96.
18. Chaudhary R. Chemo-preventive potential of an Indian medicinal plant (*Tinospora cordifolia*) on skin carcinogenesis in mice. J Environ Pathol Toxicol Oncol, 2008; 27(3): 233-43 <http://dx.doi.org/10.1615/JEnvironPatholToxicolOncol.v27.i3.70> PMID:18652570.
19. Debabrata Das, M.D.(Ayu.) Speciality: Kayachikitsa, S. K. Agarwal, and H. M. Chandola Protective effect of *Yashtimadhu* (*Glycyrrhiza glabra*) against side effects of radiation/chemotherapy in head and neck malignancies.
20. Medicinal Plants and Cancer Chemoprevention Avni G. Desai, Ghulam N. Qazi, Ramesh K. Ganju, Mahmoud El-Tamer, Jaswant Singh, Ajit K. Saxena, Yashbir S. Bedi, Subhash C. Taneja, and Hari K. Bhat*
21. Dilip khemji jain Review: Kakamachi(*Solanum nigrum*) –a prominent herb in ayurveda
22. <https://www.easyayurveda.com/2017/05/09/bhumyamalaki-phyllanthus-niruri>
23. V. Duraipandiyan, N. A. Al-Dhabi, C. Balachandran, Ignacimuthu, Sankar, and K. Balakrishna Antimicrobial, Antioxidant, and Cytotoxic Properties of Vasicine Acetate Synthesized from Vasicine Isolated from *Adhatoda vasica* L.
24. Shashank Kumar and Abhay K Pandey Medical attributes of *Solanum Xanthocarpum* fruit consumed by several tribal communities as food in vitro antioxidant, anticancer and anti HIV perspective.
25. Shubhasmita Mohapatra, Jasmine Mohanty, Sarita Pani, Sunitee Hansdah, Anil Kumar Biswal Atish Kumar Sahoo, Priya Ranjan Debata Root extract of *Plumbago zeylanica* L. induces cytotoxicity, inhibits cell migration and induces S-phase cell cycle arrest through down regulation of EGFR in HeLa cervical cancer cells.
26. Middleton E, Kandaswami C, Theoharides TC. The effect of plant flavonoids on mammalian cells: implications for inflammation, heart disease and cancer. Pharmacological reviews, 2000; 52(4): 673-751.
27. Curcumin in Treating Breast Cancer: A Review Author yiwei wang, Jiayi yu, Ran cui, Xianting Ding.

28. smita Khanal, Stefano Dall'acqua, and Rameshwar Adhikari Bael (*Aegle marmelos*), an Underutilized Fruit with Enormous Potential to Be Developed as a Functional Food Product: A Review.
29. Sahdeo Prasad^{*} and Amit K. Tyagi Ginger and Its Constituents: Role in Prevention and Treatment of Gastrointestinal.
30. Paul B Yaffe, Melanie R Power, Coombs, Carolyn D Doucette, Mark Walsh, David W Hoskin¹ Piperine, an alkaloid from black pepper, inhibits growth of human colon cancer cells via G1 arrest and apoptosis triggered by endoplasmic reticulum stress.
31. Dong Xiao, Yan Zeng, Lakshmi Prakash, Vladmir Badmaev, Muhammed Majeed, Shivendra V Singh Reactive oxygen species-dependent apoptosis by gugulipid extract of Ayurvedic medicine plant *Commiphora mukul* in human prostate cancer cells is regulated by c-Jun N-terminal kinase.
32. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9240408/>
33. Michael S Donaldson, Nutrition and cancer: A review of the evidence for an anti-cancer diet; *Nutrition Journal*, 2004; 3: 19 doi:10.1186/1475-2891-3-19.
34. Bharat B Aggarwal, Haruyo Ichikawa, Prachi Garodia, Priya Weerasinghe, Gautam Sethi, Indra D Bhatt, Manoj K Pandey, Shishir Shishodia & Muraleedharan G Nair Traditional Ayurvedic medicine to modern medicine: identification of targets for suppression of inflammation and cancer; *Expert Opin. Ther. Targets*, 2006; 10(1): 87-118.