Review Article

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A CONCEPTUAL REVIEW OF AYURVEDIC HERBAL AND MINERAL FORMULATIONS IN ARBUDA WITH SPECIAL REFERENCE TO CANCER

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ABSTRACT

In the present era, cancer is a burning issue caused by the mutation in the cells in which cells divide uncontrollably, thus forming abnormal cell mass in the body. Other causative factors include hereditary factors, lack of exercise, alcohol, smoking, exposure to harmful radiation, consumption of red meat, high-fat diet, etc. Modern cancer therapy such as chemotherapy, hormonal therapy and radiation therapy is considered to cause dangerous side effects such as hair loss, loss of appetite, anaemia, constipation, etc., causing destruction and depletion of the body's immune system. In Ayurveda, Acharyas have mentioned various herbs and herbo-mineral formulations indicated in Arbuda, which can be used in oncology and aim to strengthen immunity, restore equilibrium, build strength, and restore. Ayurvedic herbs, mineral formulations and lepas (external application) have been mentioned. Herbs such as Ashwagandha, Haridra, Guduchi, Bhallataka, Tulasi, Rasona, and Kanchanara etc., minerals such as swarna, tamra, abhraka, vajra bhasmas etc., herbal and mineral formulations such as Kanchanara guggulu, Talkeshwar rasa, Dinardha rasa, Nityananda rasa, Roudra rasa, etc. and few Lepas have been mentioned in the various texts which are indicated in Arbuda. Despite all these formulations and herbs mentioned in Ayurvedic texts, evidence-based research is lacking to demonstrate their efficacy and potential for cancer activity. Hence, an attempt is made to review various formulations mentioned in ancient Ayurvedic texts to incorporate them into clinical practice.

Keywords: Anticancer, Arbuda, Rasoushadhi, Kashtoushadhi, Ayurveda chikitsa

INTRODUCTION

Cancer is the leading cause of death worldwide, accounting for nearly 10 million deaths in 2020. The most common cancer reported in 2020 is breast cancer, with an incidence of 2.26 million cases, followed by lung and colon and rectum cancers, with an incidence of 2.21 million cases and 1.93 million cases, respectively.[1] It is projected that there will be more than 26 million new cancer cases and 17 million cancer deaths per year by 2030.[2] Causative factors of cancer depend on environmental factors like chemicals, radiation, tobacco, alcohol, smoking, infectious organisms and factors within the cell like inherited mutations, hormones and mutations occurring due to metabolism. These factors result in abnormal cell behaviour and extensive proliferation, resulting in growth and expansion of cell mass affecting surrounding normal tissues and spreading to other parts of the body (metastasis).[3] Ayurveda describes cancer as a chronic imbalance of tridosha's (pathophysiological entities, Vata, Pitta and Kapha) and sapta dhatus (tissues) and triguna (mental qualities- satva, rajas and tamas). These imbalances can be treated by retarding the process of cancer by targeting the specific tissue and improving the quality of the patient's life using herbal (kashtaushadhi) and herbo-mineral (rasaushadhi) formulations mentioned by our acharyas in Ayurveda Samhita's.[4] Cancer is the most complicated disease, resulting in many co-occurring and has adverse effects even after treating patients with advanced techniques such as chemotherapy, radiation therapy and surgery. Though these have been practised for decades, they have common side effects. Hence, there is a need to search for newer options in cancer therapy.[5] Various medicines and treatments, ranging from single herb usage to compound formulations, which possess anti-cancerous activity, have been mentioned in Ayurveda Samhita. Kashtaushadhi (herbs) and rasaushadhi (herbo-mineral), containing multiple active principles, help in immunomodulating and antioxidant activity, which help in cancer healing, reducing side effects and cancer-associated complications.[6] Present study includes reviewing the kashtaushadhi and rasaoushadhi mentioned in texts like Bhaishajya ratnavali, Basavarajeeyam, Sahasrayoga, Sushruta Samhita, Rasayogasagara and Chakra Datta.

DISCUSSION

According to Ayurveda, cancer originates due to a deranged metabolism and imbalance of tridosha in the body, losing their mutual coordination, causing faulty division of cells and improper growth. This leads to depletion of systemic ojas in the body and tissue damage, resulting in morbid critical condition.[72] In Charaka Samhita and Sushruta Samhita, cancer is defined as inflammatory or non-inflammatory swelling, mentioned as granthi or Arbuda. According to Sushruta, malignancies affect the 6th layer of the skin, i.e. rohini (epithelium) and injure this layer in the muscular tissues and blood vessels, resulting in the manifestation of tumours. Many herbal and traditional compounds are available in Samhita to validate their use as anti-cancerous effects or drugs. This adds a step to a curative aspect of cancer that has a resemblance with clinical entities of Arbuda mentioned in different Ayurveda samhitas.[73]

Table 1: Details of Single Herbs Showing Anti-Cancerous Activity

Single herbs	Dose	Karma [action]
Ashwagandha[7]	3-6 gm	Vata-Kapha hara, balya, rasayana
Lashuna[8]	3-6 gm	Vata-Kapha hara, rasayana, balya, gulma hara
Saptaparna[9]	Decoction 40-80 ml	Tridoshahara, deepena
Ishvari[10]	Powder: 1-2 gm, Fresh leaf juice 5-10 ml	Kapha-Vata hara
Nimba[11]	Bark Powder 2-4 gm Fresh juice 10-20 ml	Kapha-Pittahara, deepana
Kajutaka[12]	-	Kapha-Vata hara
Kumari[13]	-	Kapha-Vatahara, bhedana, rasayana
Shatavari[14]	Powder 3-6 gm, Fresh juice 10-20 ml	Vata-Pittahara, rasayana
Brahmi[15]	Fresh juice 10-20 ml	Kapha-Pitta hara, rasayana
Patala[16]	Decoction 50-100 ml, Kshara 1- 1.5 gm	Tridoshahara
Nirgundi[17]	Root bark powder 3-6 gm, Seed powder 3-6 gm	Vata-Kaphahara
Dantimula[18]	Root powder 1-3 gm	Kapha-Vatahara, deepana
Kanchanara[19]	Powder 3-6 gm	Kapha-Pittahara, deepana
Ashoka[20]	Seed powder 3-6 gm, Decoction 50-100 ml	Pittahara, grahi
Daruharidra[21]	Fruit powder 5-10 gm, Decoction 50-100 ml	Kapha-Pittahara, chedana, lekhaniya (according to Charaka)
Devadaru[22]	Bark powder 1-5 gm	Kapha-Vatahara, deepana
Guduchi[23]	Stem powder 3-6 gm, Guduchi sattva 1-2 gm	Tridosha shamaka, rasayana, deepana
Haridra[24]	Powder 1-3 gm	Kapha-Vatahara, lekhana
Rohitaka[25]	Powder 1-3 gm	Kapha-Pittahara, raktaprasadana
Kutaja[26]	Powder 3-6 gm	Kapha-Pittahara, deepana
Shigru[27]	Root bark juice 10-20 ml, Seed powder 1-3 gm	Kapha-Vatahara, deepana
Haritaki[28]	Powder 3-6 gm	Tridoshahara, rasayana, lekhana
Tulasi[29]	Fresh juice 10-20 ml, Root decoction 50-100 ml, Seed powder 3-6 gm	Kapha-Vatahara, deepana
Manjista[30]	Powder 11-5 gm	Kapha-Pitta hara
Chitraka[31]	Powder 1-2 gm	Lekhana, shoolaptashamana, deepana
Tagara[32]	Powder 1-3 gm	Kapha-Vata hara

Table 2: List of Herbs and Minerals Mentioned in Schedule E1 List Showing Anti-Cancerous Activity

Herbs and minerals as per schedule e1[33]	Constituents	Karma (action)
Ahiphena[34]	*P. somniferum*	Kaphahara
Arka[35]	Papaverine	Vatahara, vishaghna, deepana
Bhallataka[36]	Oil extracted from nuts	Kapha-Vatahara, Bhedana
Bhanga[37]	Cbd+thc	Kapha-Vatahara
Danti[38]	Methanol extract	Kapha-Vatahara, deepana
Dhattura[39]	Ethanolic leaf, stem extracts	Kapha-Vatahara, vishaghna
Gunja[40]	Ethyl Acetate fraction	Kapha-Vatahara
Jayapala[41]	Seed extract	
Karaveera[42]	Oleandrin	Kapha-Vatahara
Langali[43]	Phytochemical extract of tubers	Kapha-Vatahara
Parasika yavani[44]	Grossamide, Cannabisins D and Cannabisins G	Kapha-Vatahara, deepana, pachana
Snuhi[45]	Diterpenoids (compound 6) Compound 15	Kapha-Vatahara, deepana
Vatsanabha[46]	Aconitine	Rasayana, Vata-Kaphahara
Vishamushti[47]	Brucine strychnine	-

Table 3: Details of Lepa's Mentioned in Basavarajeeyam[48]

Medicine	Mode of usage
Gandhadi lepa	External
Yavaksharadi lepa	External
Haridradi lepa	External
Chitramulaadi lepa	External
Roudra rasa	Internal

Table 4: Details of Lepa's Mentioned in Bhaishajya Ratnavali[49]

Dosha avastha	Kriya krama
Vataja Arbuda	Upanaha prepared from meat or vesavara added with snigdha (unctuous) substance should be applied. Nadi sweda, followed by shrunga therapy (bloodletting), should be performed several times.
Pittaja Arbuda	Mild swedana, upanaha and virechana are useful in Pittaja Arbuda.
Pittaja Arbuda garsha lepa	Leaves of udumbara, shaka and goji are rubbed repeatedly on Arbuda. Later on kalka of sarjarasa, priyangu, pattanga, lodra, arjuna & arista with honey is applied.
Kapha Arbuda nasha lepa	Kalka of shanka bhasma and kshara of mulaka is applied externally.
Medho Arbuda	Haridra, lodhra, patala, grihadhuma, and manahshila are made into kalka by adding honey and applied as lepa.
Sarkara Arbuda	All the therapies mentioned in Vataja, Pittaja, Kaphaja, and medhoja are helpful in the management of sarkara Arbuda.
Arbudahara lepa	Kalka of kshara of rambha, mochaka, tusha, shanka bhasma, rudira sarata, ardhraka, gandhaka, yavakshara, vidanga and shunti on application cures Arbuda.

Table 5: Details of Internal Medicines in Bhaishajya Ratnavali

Formulation	Dose	Anupana
Roudra rasa	125 mg	Honey
Kanchanara guggulu	1 pill (Gutika)	Decoction of Khadira sara (plant bark), koshna abhaya (decoction of Haritaki).

Table 6: Details of Formulations Mentioned in Sahasrayoga

Formulation	Dose	Anupana
Khadirarishta[50]	15-20 ml	Jala (water)
Gandhira rasayana[51]	5-10 gm	Ushna jala (warm water)
Brihat madhusnuhi rasayana[52]	5-10 gm	Ushna jala, sukoshna dugdha
Pancha tikta guggulu ghrita[53]	10-15 ml for shamana	Ushna jala

Table 7: Details of Lepa Mentioned in Chakra Datta

Formulation	Mode of usage
Gunjadya taila[54]	External
Sarjikadi pralepa[55]	External
Upodika swarasa[56]	Externally used for prakshalan (washing)
Snuhyadi sveda[56]	External
Haridradi lepa[56]	External

Table 8: List of Formulations Mentioned in Rasayogasagar

Formulations	Dose	Anupana
Dinardha rasa[57]	Mudga matra	Water
Talkeshwar rasa (XV)[58]	Ardha gunja	As per the disease condition
Tryambaka abram[59]	1-1 Tab	As per the disease condition
Tryushnadi vati[60]	3-6 Masha	As per the disease condition
Nityananda rasa[61]	1-1 Tab	Sheeta jala (cold water)
Nritpatti vallabha rasa (I)[62]	1-1 Tab	As per the disease condition
Mohadrivajra pata rasa[63]	1-1 Tab	As per the disease condition
Lakshminarayana rasa (III)[64]	1-1 Ratti	As per the disease condition
Lavanga paka[65]	4-4 Masha	Honey
Yogaottama vati[66]	1-1 Tab	As per the disease condition
Someshwar rasa[67]	1-1 Tab	As per the disease condition
Hemadri rasa[68]	1-1 Tab	As per the disease condition
Kanakagiri rasa (II)[69]	1 Masha	As per the disease condition
Kamalaka vati[70]	4-4 Masha	Gomutra

Table 9: Details of Arbuda chikitsa Mentioned by Sushruta[71]

Dosha avastha	Kriya krama
Vataja Arbuda	A poultice made of karkadruka, eruvaka, coconut, priyala and castor seeds boiled with milk, water and ghee mixed with oil is applied, and nadi sweda followed by raktamoshana (shringa) is done. Vata subsiding drugs, milk and kanjika should be given.
Pittaja Arbuda	Administration of mild fomentation, poultices, and virechana are effective. Externally leaves of udumbara, saka and gojihva are rubbed on Arbuda, it is then plastered with fine powders of sarjarasa, priyangu, pattanga, lodhra, anjana, yastimadhu with honey. Alternatively, a plaster composed of aragvadha, gojihva, soma, and shama is applied after raktamokshana. Internally ghee prepared with kalka of klitaka and kwatha of shama girihva, anjanaki, draksha and saptalika is given.
Kaphaja Arbuda	Raktamokshana is done after shodana therapy. Lepa, composed of Vamana virechana drugs, is applied to the Arbuda.
Medhoja Arbuda	Fomentation is followed by incision; incised part is applied with drugs of Haridra, grhadhuma, rodhra, patanga, manshila, and haratala mixed with honey. After purification, Karanja taila is applied.

The most commonly used anti-cancerous Ayurvedic herbs, minerals and compound formulations are Ashwagandha, Guduchi, Haridra, Tulasi, Amalaki, tamra, swarna bhasma, and vajra bhasma. These drugs work as immunomodulators at the DNA level, fight against cancer and inhibit the uncontrolled division of cells.

Various parada preparations, Ayurvedic anti-cancerous drugs and compound formulations help to remove free radicals and toxins from the body. It increases immunity by destroying cancer cells and restores the functioning of various organs, providing quality life.[74]

A study was conducted on "*In vitro* and *In vivo* evaluation of a standardized *Curcuma longa* Linn formulation in cervical cancer", where a standardized turmeric extract NBFR-03 was evaluated for its anticancer and chemopreventive activity in clinical and paraclinical activity and concluded that turmeric extracts alone may not cure invasive or advanced cancer but they have potential to prevent cancer with chemoprevention therapy. It is also mentioned that the turmeric extracts possibly reduce the side effects caused by cancer therapy and modify the progress of cancer when it is used as complementary therapy.[75]

A dissertation has been published on "Scientific evaluation of antioxidant and anticancer activity of Kanchanara guggulu vati by in vitro methods" and concluded that MTT assay for methanolic crude extract of Kanchanara guggulu inhibited 50% of cell growth at the concentration of 55.26 µg/ml. The phytochemical investigation revealed the presence of flavonoids, phenolic acids, alkaloids, fatty acids, fixed oils, steroids, carbohydrates and saponins. DNA fragmentation was conducted and observed in flavonoid fraction treated cells, confirming Kanchanara guggulu's ability to induce apoptotic cell death.[76]

Another article published by IJPRIF was done, "Evaluation of the anticancer activity of *Vitex negundo* Linn in experimental animals an *in vitro* and *in vivo* study". The phytochemical analysis of Nirgundi revealed the presence of terpenoids, alkaloids, and flavonoids. Flavonoids have been found to have antimutagenic and anticancer properties. Furthermore, flavonoids play a chemopreventive impact on cancer by modulating signal transmission in cell proliferation and angiogenesis. According to prior findings, *Vitex negundo* Linn (Nirgundi) has antioxidant properties. Thus, the antitumor impact of Nirgundi may be related to its flavonoids and its antioxidant capability. In treated mice, the ethanolic extract of Nirgundi restored the mean survival time and decreased tumour volume count. Thus, it revealed that Nirgundi has potent anticancer activity and increases life duration. Using various cell lines, additional research is being conducted to describe the active principle and understand the mechanism of action of Nirgundi.[77]

Roudra Rasa is a novel herbo mineral formulation mentioned in Basavarajeeyam and Bhaishajya Ratnavali indicated in Arbuda. It contains shuddha parada, which removes jara, mrutyu and ruk, and shuddha gandhaka, made into kajjali. Kajjali has yogavahi and rasayana properties[78] and other bhavana dravyas like gomutra,[79] Nagavalli,[80] Meghanad,[81] Pippali[82] and Punarnava,[83] which is said to have anti-carcinogenic activity. An article has been published where two samples of Roudra rasa have been prepared, containing Hingulottha parada, considered the best according to traditional scriptures. A thorough SOP has been created, and instrumental analysis has also been done. Infrared spectroscopy of both samples revealed they were free of any organic compounds and represented components with long chain bands and different functional groups. Both formulations can, therefore, be advised for medical use, but based on traditional Ayurvedic literature and manufacturing methods, the formulation made with Hingulutha parada may be of higher quality and be advised for treating Arbuda.[84]

In Table 2, we have screened the list of herbs and minerals mentioned in schedule E1 showing anti-cancerous activity. Though it has toxic effects, these drugs, after undergoing proper shodhana and deciding the suitable dose, these drugs can be administered, and anticancer activity can be proven.

A study conducted on Dhatura by collecting the plant sample and utilizing the Soxhlet device to extract the methanol assisted the investigation. The MTT assay evaluated the extracted sample's anticancer efficacy against the MCF-7 cell line. It was concluded that compared to the stem, the methanolic leaf extract of Datura metal is thought to have a strong anticancer potential.[86]

Purification of Bhallataka *(Semecarpus anacardium* L.f*.)* enhanced anticancer activity. A chemical comparison and evaluation of the anticancer activity of raw and purified samples of mature fruits of *Semecarpus anacardium* were conducted. According to the findings, when compared to the raw sample, purification boosted the anticancer effectiveness of certain chemicals by imparting chemical modifications.[87]

Papaver somniferum Linn (Ahiphena) is a member of the Papaveraceae family and is frequently used for therapeutic purposes due to its abundance of alkaloids, including morphine, noscapine, narcotine, codeine, papaverine, and others. According to recent studies, alkaloids produced from Papaver species could be useful as sedatives or analgesics and in other contexts, such as cancer treatment. The alkaloids from *Papaver somniferum* Linn, which interact with tubulin and have anticancer and antiangiogenic properties, include noscapine. Codeinone is an oxidative by-product of morphine that exhibits anticancer properties and causes apoptosis by fragmenting DNA. An article on the anticancer activity of "*Papaver somniferum* Linn" was published. This study was conducted to determine antiproliferative and cytotoxic effects of *Papaver somniferum* Linn extracts on HeLa (Human Cervix Carcinoma), HT29 (Human Colorectal Adenocarcinoma), C6 (Rat Brain Tumor Cells), and Vero (African Green Monkey Kidney) cell lines. The results demonstrated that these extracts could reduce cell growth, opening up new avenues for treating cancer disorders. *Papaver somniferum* Linn extracts generally displayed exceptional antiproliferative action, in line with earlier results employing other methodologies. Necrosis is an unintentional rise in LDH plasma membrane leakage and uncontrolled cell death. Therefore, the results of the LDH assay may indicate that opium extracts exhibit a minimal necrotic effect on cells at therapeutic dosages. The results demonstrated that opium extracts had significant promise as a helpful treatment since they had high antiproliferative and low cytotoxic actions against cell lines at IC_{50} values.[88]

On examining the bar graph or the formulations mentioned by Rasayogasagar, it is observed that swarna, loha, tamra, hartala and abhraka have been used as ingredients in many formulations.

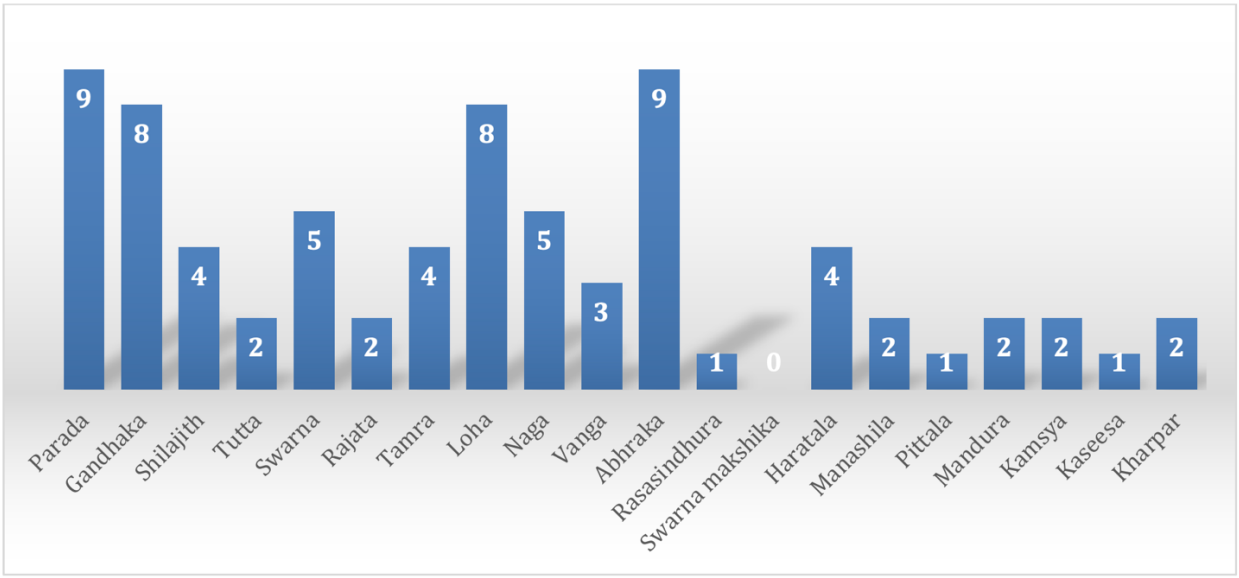

Figure 1: Ingredients of formulation mentioned by Rasayogasagara

Hartala

Hartala is an arsenic compound which many Ayurvedic physicians practise. Shuddha hartala is tridosha shamaka and is known to possess rasayana property.[89] In a study, Cell proliferation was analyzed using a 3-(4,5-dimethylthiazol-2-yl)-2,5¬diphenyltetrazolium bromide (MTT) assay. Apoptotic cell morphology was examined by cell staining with Hoechst 33342. After arsenic treatment, the activities of cellular caspase-3/7 were assessed. The results of the current study show that both human T lymphoblastoid leukaemia MOLT-4 cells and P-glycoprotein-expressing daunorubicin-resistant MOLT-4/DNR cells are suppressed by the inorganic arsenic compounds As_2O_3 and arsenic acid. The data also suggest that As_2O_3 and arsenic acid inhibit cell proliferation and cause apoptosis in these cells by depleting intracellular glutathione and subsequently activating caspase-3/7. In contrast, the six organic arsenic compounds investigated in this work did not impede the proliferation of MOLT-4 and MOLT-4/DNR cells but encouraged it.[90]

Swarna

Swarna bhasma are used in many Ayurvedic formulations. Shuddha swarna bhasma possess madhura rasa. When judiciously used for internal purposes, it improves virility. It is netrya and hridya (good for the eyes and heart) and is considered to be one of the best intellect promoters (medhya) and rejuvenators (rasayana). It also nullifies the ill effects of various poisons on the body and improves its radiance.[91]

An article was published on "An *in vitro* cell line study of detecting the anticancer potential of swarna bhasma using MTT assay on MCF-7 breast cancer cell line". In this study, swarna bhasma nanoparticles were tested for anticancer efficacy on MCF-7 human breast cancer cells. Swarna Bhasma nanoparticles displayed moderate and dose-dependent cytotoxicity and may be evaluated as a possible anticancer drug against the MCF-7 human breast cancer cell line. This demonstrates that this bhasma is hazardous to MCF-7 cells in a dose-dependent manner at concentrations ranging from 12.5-200 g/mL.[92]

Tamra

Tamra Bhasma possesses Pitta saraka and lekhana property. It can cure all the acute and chronic diseases of Pitta, Kapha or Pitta-Kapha dosha predominance. It is Agni deepana and is used in managing Udara roga, Pandu, Kushta roga, Shwasa, Kshaya and Grahani roga. Its judicious use prolongs the healthy life span. It is deha shodhaka and has rasayana property.[93]

Copper nanoparticles and copper-loaded chitosan nanoparticles were studied *in vitro* anticancer efficacy in MG-63 osteosarcoma cancer cells, demonstrating concentration-dependent lethal effects by CuSO4 and CuCNPs. CuCNP had a greater anticancer impact due to higher mitochondrial ROS levels when compared to the control.[94] Copper oxide nanoparticles induce autophagy in human breast cancer cell lines in a time and dose-dependent manner, implying that a combination of CuONPs and an autophagy inhibitor could be used to cause apoptosis in breast cancer cells.[95]

Loha

Loha Bhasma has a long history of use in the Indian Ayurvedic medicinal system for treating anaemia and other human ailments. A recent experimental toxicity investigation in albino rats demonstrates that loha bhasma had no adverse effects even when delivered at a dose five times greater than the therapeutic dose. It can be effectively utilized as a carrier for targeted drug delivery and hyperthermia-based cancer therapy applications. In this situation, the heat generated by an oscillating magnetic field successfully causes necrosis of cancer cells while causing little visible damage to neighbouring normal tissue. Bio-endogenous magnetite minerals have been postulated to have a significant role in long-term information storage in the human brain and other species. Aside from stimulating hemoglobin-boosting activities, loha bhasma is thought to have antiaging and memory regeneration advantages in humans.[96]

Abhraka

Abhraka bhasma is a popular Ayurvedic preparation that can be used alone or as an ingredient in other formulations. Abhraka is a kind of mica known as biotite. Abhraka bhasma is an important Ayurvedic formulation in which mica is burnt numerous times to

produce nanoparticles that are then utilized in therapies to treat various diseases. An article was published on "Abhraka bhasma (biotite mica nanoparticles) induces cytotoxicity in Adenocarcinoma Human Alveolar Basal Epithelial Cells (A549)" where abhraka bhasma nanoparticles were tested against A549-Human lung adenocarcinoma cells for detecting anticancer activity at the concentration 0µg/mL,12.5µg/mL, 25µg/mL,50µg/mL, 100µg/mL and 200 µg/mL for 24 hours. Cytotoxicity was determined using MTT assays; MTT results have revealed that as the concentration of nanoparticles increased to12.5µg/mL, 25µg/mL, 50µg/mL, 100µg/mL and 200 µg/mL, cytotoxicity was seen in a dose-dependent manner. In the MTT assay, cell viability was reduced to 94%, 90%, 85%, 69%, and 40% for the concentration of 12.5µg/mL,25µg/mL, 50µg/mL, 100µg/mL, 200µg/mL respectively.[97]

Rasayana chikitsa is comprehensive, improving the overall health of the body and providing greater disease resistance. It promotes nutrition by improving Agni and promoting the competence of srotas in the body. Various types of rasayana formulations and plants were described in Ayurveda, like Brahma rasayana, Chawanaprasha avaleha, Triphala rasayana, Vardhamana Pippali, etc. Rasayana herbs, such as Ashwagandha, Bala, Kashmari, etc., act as adaptogens and increase the strength of tissues and organs. Minerals used for rasayana are swarna, abhraka, hiraka, etc. increasing ojas. Animal products with the rasayana effect, such as milk ghee, have qualities similar to ojas. Usually, in cancer oja kshaya lakshana are seen due to etiological factors and chemotherapy etc. These rasayana's help to nourish the body and act as potent antioxidants and neuroendocrine immunomodulators.[98]

CONCLUSION

In reviewing the Ayurvedic text, Ayurveda mentions several references for many herbal and mineral formulations with anti-cancerous activity. When it comes to cancer, it is to be remembered that it is described as asadhya in Ayurvedic classics. However, these herbal and mineral formulations can ensure quality of life and relief from chemotherapy and hormonal therapy side effects. In herbal formulations, each herb contains multiple active principles, which produce therapeutic effects essential for lowering abnormal cell division and also reduce the side effects caused by chemotherapy. With further improvement and research, Ayurvedic physicians may be able to prescribe these medicines to cancer patients. The scientific community must redirect its priority to Ayurvedic medicine research for cancer management. Lack of research works to understand the anticancer potential such as Lavanga paka, Nityananda rasa mentioned in Rasayogasagara, and Gandhira rasayana mentioned in Sahasrayoga are few examples where there is a lack of research works conducted for cancer treatment. Rare availability of few plant species, unavailability of authentic minerals such as swarna bhasma, sasyaka, etc., difficulty in the method of preparation of few formulations such as in Nityananda rasa contains shuddha parada, shuddha gandhaka, shuddha tamra, shuddha vanga, kamsya, vanga, haratala, tuttha. Even though it is a tedious process to manufacture the formulations, more herbs and herbo mineral formulations are still mentioned in Ayurvedic texts. They need further research, clinical trials and *in vitro-in vivo* studies to prove their efficacy as anticancer drugs. Cancer treatment in Ayurveda can be accomplished with the correct amount of effort and commitment. Hence, it is necessary to raise awareness of Ayurveda in oncology.

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