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REVIEW ARTICLE

INDIAN FOOD AND SPICES AS A CANCER REMEDIES

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ABSTRACT

Due to the widespread esteem and deliberate supremacy of modern medicine in today's swift society, till date natural medicine has been criticized for being backwards and unreliable. But the truth is that in name of ease, our swift society has gifted us many life threatening diseases like cancer. Apart from the western medicines, use of natural remedies is making its own way now days just because of its less side effect and prominent pharmacological properties. Even though many research works is done for traditional Indian spice and foods, we need to emphasize this field with systemic approach of research. In this article a small effort is made to catalog the Indian spices and food as cancer remedies. However it is not possible to wrap all the Indian spices in one single pack of article, we have selected a few of them and indexed theirs till days research work on their anti-cancer chattels.

INTRODUCTION

The medicinal effects of Indian foods and spices have been recognized since many centuries. It is well known that the Indian spice's need and requirement persuade the European people to find out the new travelling path towards India, which was letter conveyed the discovery of United states of America. However it's strange that the obvious nutrition has become overlooked in the modern lifestyle, and how in the name of ease our swift society has gifted fast foods, junk food, quick fix medicines, and eating on the dash approach. [1]

It has always being center of debates around worlds that urbanization being curse or blessing for the humanity, howsoever apart from the convenience offered by the technology, many life threatening diseases like cancer may worsen due to our blind adaptation of urbanization and swift life style. Fortunately, there is an emerging focus in the important role that nutrition plays for maintenance of wellness and prosperity of peoples. As per Ayurveda the India's ancient science of life, health and longevity, the Indian foods are always playing a prominent role in buoying up health and are therefore considered as a medicine.

So far cancer is concerned, it is accounted that dietary factors has been the primary cause for about 30% of cancers in Western countries, and it's making diet as a second most preventable cause after tobacco.[2] However the contribution of dietary factor to cancer risk in developing countries is being lower, perhaps around 20%.[3] This statistics pointing us towards believe that use of healthy and traditional diet might decrease epidemiology of cancer like life threatening diseases. Due to this reason, less epidemiology of breast cancer in rural area is observed as compare to urban area. As per research in urban areas, 1 in 22 women develops breast cancer during her lifetime as compared to rural areas where 1 in 60 women develops breast cancer in her lifetime. [4]

Unscrambling the effects of Indian food and spices on minimizing cancer risk is always being a great point of interest for researchers. Researches to date have uncovered many denoted property but any how they left annoyingly large areas of uncertainty. Howsoever to fill the gap of uncertainty the current review article has been prepared. However abridgment of all the Indian food and spices with anticancer property is the gigantic errand and can't be direct in bounded words.

In this review, we have summarized our view of the current state of knowledge on Indian food and spices towards their curing mysterious properties for the cancer. So far numerous reviews had been published in correlation between diets and cancer, but on our review we are scrupulously summarizing cancer related pharmacological activity, this review is based on either the results of large prospective studies or the few randomized controlled trials.

CAPSAICIN

Capsaicin and several related compounds which are called as capsaicinoids are produced as a secondary metabolites of chili peppers. And it had been linked with suppression of tumorigenesis. Capsaicin has exhibited its anticancer assets on animal models by suppressing carcinogenesis of the skin (5), colon (6), lung (7), tongue (8), and prostate (9, 10). In culture, capsaicin has also suppressed the growth of various human tumor cells (11, 12), including leukemic (13–15), gastric (16), hepatic (17), glioma (18), and prostate cells (9).

The mechanism of action of capsaicin is not fully understood, but it have been implicated due the roles of NADH oxidase activity (11), proteasome (9), cyclooxygenases (19), c-Jun NH2-terminal kinase (20), nuclear factor-nB (21), peroxisome proliferator-activated receptor g (22, 23), peroxynitrite (18), and mitochondrial respiration (24). Its immunosuppressive effects had also been linked to its ability to suppress nuclear factor-nB activation (25).

CURCUMIN

Curcumin (diferuloylmethane) is a poly-phenol originated from the plant Curcuma longa, commonly known as turmeric. Its anti-cancer effect had been seen in a few clinical trials, mainly as a native chemoprevention agent in colon and pancreatic cancer, cervical neoplasia and Barrets metaplasia. Curcumin has a low systemic bioavailability after oral consumption which limits its therapeutic concentrations in tissues outside the gastrointestinal tract. Nevertheless, many pre-clinical studies had shown anti-carcinogenic effects in different tumor cell-lines and animal models.

For example, Labbozzetta et al. lay bared a multidrug-resistant (MDR) variant of the MCF-7 breast cancer cell line (MCF-7R) and found substantial anti-tumor activity of curcumin was on both cell lines. It has been thought anti-tumor effects of curcumin in breast cancer is may be either ER-dependent or ER-independent mechanisms; or it act as a drug transporter-mediated MDR reversal agent. [26]

The efficacy of curcumin as an anti-cancer agent was also shown in bladder cancer cell lines [27] and in prostate cancer [28, 32]. Moreover, the in vivo study revealed that curcumin induced apoptosis in situ, which inhibits the development of bladder carcinoma.

To demonstrate chemo-resistance reversal and enhance the activity of thalidomide and bortezomib used to treat patients with multiple myeloma was investigated along with curcumin by in vitro and in a xenograft model in nude mice [29, 30]. The results showed that curcumin inhibited the proliferation of human multiple myeloma cells regardless of their sensitivity to dexamethasone, doxorubicin, or melphalan.

In a separate study of human mammary epithelial carcinoma cells, prostate cancer cells and B-lymphoma cells grown in vitro, curcumin was found to induce apoptosis selectively in the malignant cell lines by increasing p53 expression at the G2 phase of the cell cycle and by releasing cytochrome c from mitochondria [31]. An interesting finding in this study was that curcumin appeared to be sparing of the normal epithelial cells by arresting them at the G0 phase of the cell cycle by down regulation of cyclin D1 and its related protein kinases (Cdk4/Cdk6) or upregulation of the inhibitory protein p21Waf-1.

The mechanisms of curcumin-induced apoptosis have been tested from different aspects. One interesting finding in a recent publication shows that it activate the caspase enzymes as a trigger for apoptosis. [33]

ALLICIN

Allicin is an organo-sulfur compound obtained from garlic, a species in the family Alliaceae. When fresh garlic is chopped or crushed, the enzyme alliinase converts alliin into allicin, which is responsible for the aroma of fresh garlic.[34] The allicin generated is unstable and quickly changes into a series of other sulfur-containing compounds such as diallyl disulfide. [35]

Allicin induced activation of extracellular signal-regulated kinases 1 and 2 (ERK1/2) in human peripheral mononuclear cells which letter leads to cell-mediated cytotoxicity in human peripheral mononuclear cells. [36]

Allicin has repressed the invasion and metastasis of human colon carcinoma cells in vitro at non-cytotoxic concentration through down-regulating the expression of vascular endothelial growth factor (VEGF), urokinase receptor (uPAR) and heparanase mRNA. [37] Allicin can inhibit telomerase

activity and induce apoptosis of gastric cancer SGC-7901 cells. [38]

Allicin had reduced the development of mammary cancer in animals and suppressed the growth of human breast cancer cells in culture. [39] Artesunate and allicin in combination exert synergistic effects on osteosarcoma cell proliferation and apoptosis. [40]

ANETHOLE

Anethole (anise camphor) is an organic compound that is extensively used as a flavoring substance. It is a derivative of phenylpropene, a type of aromatic compound that transpire widely in nature, in essential oils. It contributes a large component of the odor and flavor of anise and fennel (both in the botanical family Apiaceae), anise myrtle (Myrtaceae), liquorice (Fabaceae), camphor, magnolia blossoms, and star anise (Illiciaceae). [41]

Anethole has shown antibacterial activity against selected food-borne pathogens by making firstly a break through the permeability of cell membrane associated with generalized the integrality of membrane-disrupting effects, leading to the leakage of electrolytes as well as losses of proteins, and reducing sugars. These changes resulted in cell decomposition and death eventually, and this corresponded to a simultaneous reduction in the number of viable bacteria. [42]

Anethole and its derivative anethole dithiolethione (ADT) have been shown to increase intracellular levels of glutathione and glutathioneS-transferase [43-45]. These two compounds and two other derivatives (eugenol and isoeugenol) can also act as antioxidants [46] with the ability to suppress tumour necrosis factor (TNF)-induced lipid peroxidation and generation of reactive oxygen species (ROS), and to reduce oxidative stress by acting as scavengers of hydroxyl radicals [43, 47].

Anethole has also been shown to block both inflammation and carcinogenesis. It suppresses activation of the activator protein 1 (AP-1) and nuclear factor-kappa B (NF-κB) [48, 49], TNF-induced activation of c-JUN N-terminal kinase and mitogen-activated protein kinases (MAPK) [50, 51]. It is also a potent inhibitor of kappaB-alpha (IκBα) phosphorylation and degradation, and of expression of NF-κB reporter gene. There is one report on the anticancer effect of anethole in vivo in a murine carcinoma model. [52].

CROCETIN

Crocetin is a natural apocarotenoid dicarboxylic acid that is obtained in the crocus

flower and Gardenia jasminoides (Saffron) [53] (fruits). It forms brick red crystals with a melting point of 285 °C.

Crocin and crocetin may provide neuroprotection in rats by reducing the production of various neurotoxic molecules, based on an in-vitro cell study.[54] Crocin and Diglucosylcrocetin inhibited early tumor antigen expression of adenovirus infected cells. [55].

Saffron inhibited the DEN-mediated elevations in numbers of cells positive for Ki-67, cyclooxygenase 2, inducible nitric oxide synthase, nuclear factor-kappa B p-65, and phosphorylated tumor necrosis factor receptor. [56] Crocetin proves to scavenge free radical and plays an important role in cellular function. Tumor incidence and histopathological studies proves crocetin is a potent antitumour agent. [57, 58]

Gingerol

Gingerol or [6]-gingerol, is the active constituent of fresh ginger rhizome (Zingiber officinale - Zingiberaceae). The [6]-gingerol, a major pungent ingredient of ginger is having a potent antiangiogenic activity in vitro and in vivo. [6]-gingerol may inhibit tumor growth and metastasis via its anti-angiogenic activity [59]. Topical application of [6]-gingerol inhibited COX-2 (cyclooxygenase-2) expression along with suppressed NF- kB DNA inding activity in mouse skin. [59]

The proposed mechanisms of action of gingerol involved in anticancer and chemopreventive properties via multiple pathways that includes the inhibition of cyclooxygenase -2 (COX-2) expression by inhibiting p38 MAPK–NF-κB [59],(mitogen activated protein kinase – necrosis factor kappa B) signaling pathway[60], Ovarian cancer Inhibiton NF-κB [61].

Ginger extract has shown significant action on Liver cancer by reducing the elevated expression of TNF-α and NF-κB rats. [62] It has also inhibited cell adhesion invasion motility in vitro in Breast cancer cell lines. [63]

Gingerol has also exhibited significant anti-cancer property against Skin cancer by enhancing apoptotosis in Mouse [64] and against colon cancer by inhibition of leukotriene activity in mice mice. [65] It has also revealed noteworthy property against human liver tumor cell (lines) in vitro. [66]

CONCLUSION

Indian spice products have been proved a prime source for the treatment of cancers from a long era, many of them are consumed daily with the diet. They provide significant

protection against various cancers and many other diseases. The antioxidant medicinal plants and their products prevent us from the cancer and other diseases by protecting cells damage. Thus, consuming a rich diet of Indian spices will provide unquestionably health-shielding to us.

All the spices discussed in this review exhibit anticancer activities. Indian spices offer a great opportunity to us for discovery of not only totally new chemical classes of anticancer agents, but also a novel and potentially active remedies with relevant mechanisms of action. Since we can't cover all the Indian spices with anti-cancer property it recommend us to intensify our research towards anticancer properties of Indian spices. We may need also to formulate some novel formulation with this potent ingredient of Indian spices to build a healthy human society.

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