A REVIEW ON POTENTIAL USES OF CULINARY VEGETABLES USED IN ROUTINE LIFE AS AN ANTICANCER AGENT

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ABSTRACT
Cancer is a disease which leads to death, and chemotherapy is a treatment used to treat cancer. Lung cancer and breast cancer are most effective one in the world. The present study examines the anticancer property of culinary vegetables such as Allium vegetables, cruciferous vegetables, and beetroot which are used in day-to-day life have anticancer properties. Allicin and gallic acid in garlic decreases the risk of colon, pancreas, stomach, esophagus, and breast cancers. In onion, cysteine sulfoxide is sulfur compounds which have anti-cancer, antiplatelet, and antithrombotic property. In broccoli, glucosinolates and sulfur compounds play a major role in the treatment of breast and prostate cancer. Betacynin is a compound present in beetroot which has antioxidant property and anticancer activity.

Keywords: Anticancer, Gallic acid, Cysteine sulfoxide, Glucosinolates, Betacynan.

INTRODUCTION
Cancer is a deadly disease that involves abnormal cell growth and spread to other parts of the body [1]. Cancer is not only one disease but also a group of more than 100 distinct disorders [2]. It is the second leading cause of mortality in the world, and chemotherapy is the main modalities available for cancer treatment. However, recently, chemotherapeutic drugs which are available in the market are reported to exhibit toxicity toward normal tissues and possess undesirable side effects [3]. Cancer influences any race, any age group, or societal class and disseminated all around the world that leads to significant loss of human lives. Statistics indicates that men are mostly suffered from lung, colon, rectum, and prostate cancer, while women increasingly suffer from breast, colon, rectal, and stomach cancer [4]. Two types of tumors are benign tumor (non-cancerous) and malignant tumor (cancerous). Most common type of cancer includes lung cancer, breast cancer, liver cancer, stomach cancer, and colorectal cancer.

Cancers are classified by the tumor cells and are made up of special type of cells. These include carcinoma (tumors derived from the epithelial bodies of the cell organs), sarcoma (tumors arise from the connective tissue such as bone, cartilages, fat, and nerve), lymphoma/leukemia (tumors arise from blood-forming cells), germ cell tumor (tumors derived from pluripotent cells and germ cells present in the testicile or ovary), and blastoma (tumors derived from the immature precursors cells) [5].

Cancer-fighting vegetables include Allium vegetables (garlic, leeks, and yellow and green onions), cruciferous vegetables (broccoli, brussels sprouts, cauliflower, kale, red cabbage, and curly cabbage), spinach, and beet root also scored in the top ten against many of the cancers tested.

GARLIC (ALLIUM SATIVUM)
Garlic (A. sativum L.) belongs to family Amaryllidaceae, and it is also called as poor man’s treacle. The garlic bulb consists of more than 200 chemical compounds, such as volatile oil with sulfur-containing compounds, namely ajoene [4,5,9-trithiododeca-1,6,11-triene-9-oxide], allin, and allicin, enzymes, namely peroxidase, allinase, and myrosinase and other compounds like -phellandrene, - phellandrene, linalool, citral and geraniol are important [6].

Garlic acts as insecticidal, antimicrobial, antiprotozoal, and antitumor activity [7,8]. Epidemiological and experimental studies explain that garlic is a potent vegetable for the prevention of cancer. The anticancer effect of garlic has been reported to exhibit the anticancer effect through their anticarcinogenic, antimutagenic, and antitumor properties by fresh extract, powder, oil of garlic, and several organosulfur compounds derived from garlic. The mechanism of action was found to be inhibition of carcinogen activation, boost phase 2 detoxifying processes, cell cycle arrest of malignant cells mostly in G2/M phases, stimulation of the mitochondrial apoptotic pathway, and an increase of histone acetylation [9,10]. The main components of garlic are amino acids (glutaminic acid, arginine, aspartic acid, leucine, lysine, and valine) [11], gallic acid such as polyphenolic compounds, minerals (manganese, potassium, calcium, and phosphorus and in minor quantities: Magnesium, selenium, sodium, iron, zinc, and copper), vitamins (Vitamin B6 and also Vitamin C and in minor quantities, folic acid, panthotenic acid, and niacin), essential oil with many sulphur-containing components (allyllysufide and allyltrisulfide), Allin, Ajoene, quercetin, and sugars (fructose and glucose) [12,13]. The fibrinolytic activity of garlic in both man and experimental animals has been reported. Many claims have been done on garlic for antibiotic action, hypoglycemic effect, antitumor, antioxidant, and antithrombotic properties [14-17] and have also been attributed to the garlic extracts.

Anticancer activity of garlic
Allicin is one of the most important predecessor of bioactive compounds of garlic. A number of population studies demonstrated a relationship between excess garlic intake and reduction in risks of pancreas, colon, stomach, esophagus, and breast cancers [18]. The organosulfur compounds derived from garlic have been reported to exhibit the anticancer effect through their anticarcinogenic, antimutagenic, and antitumor properties. Recently, studies shown that sativum lectin 50 (ASL50, 50 kDa) isolated from A. sativum exhibited antiproliferative activity on oral carcinoma KB cells and induces 2.5-fold higher caspase-3 enzyme activity than untreated cells [19].

Anticarcinogenic activity of garlic is also thought to be due to the modulation of carcinogen metabolism. The cell cycle arrest by diallyl disulfides (DADS) in human colorectal tumor cell line, HCT-15,
epidemiologic studies have indicated that consumption of broccoli is associated with a lower risk of cancer, including breast, prostate, lung, stomach, and colon cancers [38-40]. The anticancer effect of broccoli has been attributed to sulforaphane (SFN), an isothiocyanate formed by hydrolysis of a precursor glucosinolate called “glucoraphanin.” Although glucoraphanin [41] is found in varying amounts in all cruciferous vegetables, the highest concentration of this compound is found in broccoli and its sprouts [42].

Anticancer effect of broccoli
SFN suppresses the expression of multidrug resistance protein, reduced drug efflux, and increased anticancer activity. In subcutaneous tumor model of Barrett esophageal adenocarcinoma, a significant decrease in tumor volume was also observed. The anticancer activity was mainly due to the induction of caspase 8 and p21 and down-regulation of hsp90, a molecular chaperone required for the activity of several proliferation-associated proteins. It also shown that bread enriched with broccoli sprouts was found to be effective against stomach cancer [43]. Furthermore, the effect on in vitro proliferation and motility of stomach cancer cells differing in metastatic potential were studied. Thus, these studies indicate that broccoli sprouts may serve as a valuable food supplement preventing upper gastrointestinal system.

BEEFROOT (BETA VULGARIS L.)
Beetroot is a vegetable plant and belongs to family Amaranthaceae. The roots of beet have used in traditional Arab medicine to treat a wide variety of diseases. The claimed therapeutic use of beetroot includes its antimutum, carminative, emmenagogue, and hemostatic and renal protective properties and is a potential herb used in cardiovascular conditions. It consists of chemical compounds such as betaine, betacyanins, betanin, polyphenols, and flavonoids. Beetroot possesses antihypertensive, hypoglycemic, antioxidant [44], anti-inflammatory, and hepatoprotective activities [45-48].

In beetroot, the betacyanin is a chemical constituent which is responsible for red beet color, and it is an antioxidant with modulator of oxidative stress. Research area is mainly focused on anticancer activities of beetroot extract, and in animal models, has unravelled their potential benefits as chemopreventive and chemotherapeutic agents [49].

Anticancer activity of beetroot
Treatment of ethanolic extract of beetroot reduced the amount of cleaved caspase 3 and Bax and protein expression and increased the Bcl-2 protein expression [50]. Cyanidin-3-O-glucoside chloride had growth inhibitory activities against the human colon (CACO-2), hepatocellular (HepG2), and breast (MCF-7) carcinoma cell lines, respectively [51].

CONCLUSION
For centuries, Allium vegetables have been used in a wide variety of cuisines worldwide and are valued for their potential medicinal properties. During the first Olympic Games in Greece, garlic was consumed as a stimulant, and in Roman times, soldiers chewed garlic before battle for strength. At present, these vegetables continue to hold their fascination for their unique flavor, chemistry, and biological properties. Epidemiological studies indicate that consumption of Allium vegetables was protective against cancers, particularly GIT cancer.

Garlic-derived components play major roles to protect cells from the mutation and to prevent the undifferentiated cell growth. Thus, the daily consumption of garlic may contribute to prevent cancer. As onion is rich in flavonols and organosulfur compounds, its higher intake decreases the risk of breast cancer and it is also well-known for its benefits to weight control and cancer prevention.
Broccoli by-products such as leaves and stems contain high total phenolics, and hence, it shows high antioxidant and anticancer activities. Thus, these by-products can be used as functional food ingredients in the food industry. Beetroot is rich in carotenoids and polyphenols, and it shows good antitumor, carminative, emmenagogue, and hemostatic and renal protective properties.

CONFLICTS OF INTEREST
No conflict to disclose.

REFERENCES