

# The Prevention and Treatment of Colorectal Cancer by Traditional Plants

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## ABSTRACT

Cancer of the large intestine (colon) is one of the main causes of death due to cancer. Around the world, early cancer diagnosis and treatment typically increase a person's chances of survival. But in developing nations, most people typically have limited access to efficient and contemporary diagnostic tools and facilities, particularly in rural areas, they still depend on the traditional medicinal plants. A number of treatments are used to prevent or treat the colorectal. One of the most major problems in colorectal cancer of chemotherapy is acquired drug resistance. The aim of the present work was to provide an overview of medicinal plants effective on colorectal cancer

**Keywords:** Colorectal, Intestinal, Polyp, Cancer

## INTRODUCTION

Nowadays, cancer is one of the most common diseases in humans. Cancer is a disease in which some of the body's cells grow uncontrollably and spread to other parts of the body. Colorectal cancer (CRC) is the third most common diagnosis and second deadliest malignancy for both sexes. CRC is cancer that starts in either colon or rectum. It often begins as a small lump in the intestinal mucosa or benign lesion termed an adenoma that can turn malignant depending on its size and histological presentation. Simple adenomas account for 60% of cases, while multiple adenomas account for 40%. Untreated polyp patients

are at a 24% risk of developing cancer [1]. Laparoscopic surgery, resection, palliative care, neoadjuvant chemotherapy, and radiotherapy are currently accessible therapeutic options for colorectal cancer. Chemotherapy causes undesirable side effect. Sometimes these treatments are not ineffective and expensive. [2-]). Medicinal plants are believed to be an important source of new chemical substances with potential therapeutic effects. [2] This review work is focused on the therapeutically active plants which are used in the treatment and prevention of colorectal cancer and have less side effects and less cost.

## LITERATURE REVIEW

### Traditionally used Plants for the Prevention and Treatment of Colorectal Cancer

Based on literature search, it was seemed that fruits, seeds, leaves, plant roots and whole plant were used for in vitro and in vivo studies for the prevention and treatment of Colorectal Cancer

#### *Grapes*

Grapes are a type of fruit that grow in clusters of 15 to 300, and can be crimson, black, dark blue, yellow, green, orange, and pink. "White" grapes are actually green in color, and are evolutionarily derived from the purple grape. Mutations in two regulatory genes of white grapes turn off

production of anthocyanins which are responsible for the color of purple grapes. *Grape* belongs to the family of *Vitaceae*. Grape pomace is the source of bioactive compounds (anthocyanins, flavanols, flavan-3-ols, and stilbenes) (Figure 1) which exhibit antiproliferative actions on cell

cultures. The extracts of grape pomace and grape seed showed the antitumoral effects on colon cancer cells (Caco-2, HT-29) and fibroblasts. All three extracts were active and purified extract from grape seed was the most potent and specific on Caco-2 cells. HT-29 cells [10].



Figure 1: *Grape pomace*



*Soybeans*

### *Soybeans*

Soy vegetable oil is used in food and industrial applications, is another product of processing the soybean crop. *Soybean* is the most important protein source for feed farm animals (that in turn yields animal protein for human consumption) (Figure 1). Soybean belongs to the family of *Fabaceae*. Soy saponin decreased the number of viable cells in a dose-dependent manner and suppressed 12-O- tetradecanol-phorbol-13-acetate-stimulated PKC activity ( $P < 0.05$ ). Cells treated with saponins developed cyto-plasmid vesicles and the cell membrane became rougher and more irregular in a dose-dependent manner, and eventually disassembled. However, the apoptosis markers such as c-Jun and c-Fos were not significantly affected by saponin. Soy saponin may be effective in preventing

colon cancer by affecting cell morphology, cell proliferation enzymes, and cell growth. [11].

### *Rheum ribes*

*Rheum ribes*, the Syrian rhubarb or warty-leaved rhubarb is an edible wild rhubarb species in the genus *Rheum*. *Rheum ribes* belongs to the family of *Polygonaceae*. It is a widespread plant species in the eastern part of our country and is consumed as a vegetable by the folk people. In our study, we investigated whether *R. ribes* has anti-cancerogenic effect on colorectal cancer cell lines (Figure 2). Six different extracts were obtained from *R. ribes*. Total phenolic, flavonoid contents, antioxidant activities, and cytotoxic effects of all extracts on colorectal cancer cells were determined [12].



Figure 2: *Rheum ribes*



*Nigella sativa*

### ***Nigella sativa***

The flowers of *Nigella sativa* are delicate, and usually coloured pale blue and white, with five to ten petals. The fruit is a large and inflated capsule composed of three to seven united follicles, each containing numerous seeds which are used as spice (Figure 2). *Nigella sativa* belongs to the family of Ranunculaceae. It has been used as traditional medicine for centuries. The crude oil and thymoquinone (TQ) extracted from its seeds and oil are effective against many diseases like cancer, cardiovascular complications, diabetes, asthma, kidney disease etc. It is effective against cancer in blood system, colorectal, lung, kidney, liver, prostate, breast, cervix, skin with much safety. The molecular mechanisms behind its anticancer role is still not clearly understood, however, some studies showed that TQ has antioxidant role and improves body's defense system, induces apoptosis and controls Akt pathway [13].

### ***Echinacea Purpurea***

*Echinacea purpurea* is an herbaceous perennial. Its cone-shaped flowering heads are usually, but not always, purple in the wild (Figure 3). Its individual flowers (florets) within the flower head are hermaphroditic having both male and female organs in each flower. It is pollinated by butterflies and bees. The cytotoxic effects of *Echinacea* flower extracts and cichoric acid on cell viability, telomerase activity, DNA fragmentation,  $\beta$ -catenin, caspase-9, and cleavage of poly-ADP-ribose polymerase (PARP) of human colon cancer cell were examined and showed a significant inhibition of proliferation in *E. purpurea* flower extract and cichoric acid in a dose- and time-dependent manner (Figure 3). Cichoric acid treatment decreased telomerase activity in HCT-116 cells. Moreover, Cichoric acid effectively induced apoptosis in colon cancer cells, which were characterized by DNA fragmentation, activation of caspase-9, cleavage of PARP and downregulation of  $\beta$ -catenin [14].



Figure 3: *Echinacea Purpurea*



*Linum usitatissimum*

### ***Linum usitatissimum***

Flax is also known as common flax or linseed, is a flowering plant (Figure 3) *Linum usitatissimum*, in the family *Linaceae*. Flax seed has a protective effect against cancer of the pancreas, colon and breast. Flax seed contains alpha linolenic acid (ALA, Omega 3), linoleic acid (LA Omega-6) and oleic acid (OA, Omega-9), lignans (SDG), mucilage, and vitamin a

(Beta-carotene). *L. usitatissimum* contains highly polyunsaturated fatty acids, abundant fiber with a high percentage of small amounts of potassium, magnesium, iron, copper, zinc, and various vitamins [15].

### ***Punica granatum***

*Punica granatum* is a shrub or small tree with multiple spiny branches and is long-lived. *Punica granatum* (Figure 4), belongs

to the family of *Lythraceae*. It is effective in colon, breast and prostate cancer. Root and trunk shell contains alkaloids called starch, mannite, resin, triterpene acids, tannins, pellets, isopellitieri and methyl pelletieri. Fruit peel and flowers, again mentioned above are alkaloids and tannins. It also contains pomegranate, Iron,

potassium, calcium, phosphorus, B1, B2 and C vitamins. Pomegranate juice contains high levels of tannin and flavonoid antioxidants. *Pomegranate* juice is an important anti-tumor characteristic that stimulates apoptosis and changes the cell cycle and inhibits the expression of androgen receptor [16].



Figure 4: *Punica granatum*



*Cornus mas*

#### ***Cornus mas***

*Cornus mas* is a medium to large deciduous shrub or small tree with dark brown branches and greenish twigs. seed. *Cornus mas* (Figure 4) belongs to the family of *Cornaceae*. *Cornus mas* is effective in lung, head and neck, colon, liver, breast, prostate, oesophagus and soft tissue cancers. The melatonin hormone, secreted in the brain and which increases our quality of life, is found in cranberry fruit. For this reason, it is also used to prevent complications such as depression, sleep disturbances experienced by patients during the treatment period. It also acts as antioxidant because it is a good diuretic. It is effective in removing harmful compounds accumulated in the body. *C. mas* also contain phytonutrients, vitamin K,

manganese and a wide range of natural plant chemical [17].

#### ***Vaccinium myrtillus***

*Vaccinium myrtillus* (Figure 5) is a small deciduous shrub belongs to the family of *Ericaceae*. Blueberries contain pterostilben and ellagic acid and vitamin C as well as because it is rich in cancer types especially beneficial to colon, uterus and liver cancer. Consuming a handful of fresh or dried blueberries per day significantly reduces the risk of cancer in individuals. There are proanthocyanins that give fruit color with a dye substance called V. myrtillus, A, C vitamins and useful sugars, organic acids, tannins, pectin and myrtillin. V. myrtillus can be consumed as raw fruit or dried or consumed as tea prepared. [18]



Figure 5: *Vaccinium myrtillus*



Garlic

### **Garlic**

*Allium sativum* (Figure 5) is a perennial flowering plant growing from a bulb. It belongs to the family of Amaryllidaceae. Its roots have allicin and organosulfur compounds. In an in vitro study, they inhibited cancer cell growth and induced apoptosis through the inhibition of the phosphoinositide 3-kinase/Akt pathway. They can also increase the expression of phosphatase and tannin homolog (PTEN) and reduce expression of Akt and p-Akt [32]. *Garlic* roots contain S-allylcysteine and S-allylmercaptocysteine, which are known to exhibit anticancer properties. The

garlic extract has an inhibitory effect on the size and number of cancer cells [19].

### **Glycyrrhiza glabra**

Liquorice is a herbaceous perennial belongs to the family of *Fabaceae*. The roots are Stoloniferous. *Glycyrrhiza glabra* (Figure 6) inhibited proliferation of the HT-29 cell line at a concentration of 200 µg/ml and this was confirmed by the highest rate of cell death as measured by trypan blue and MTT assays. RT-PCR results showed down-regulation of HSP90 gene expression which implied an ability of *Glycyrrhiza glabra* to induce apoptosis in HT-29 cells and confirmed its anticancer property [20].



Figure 6: *Glycyrrhiza glabra*



Ginger

### **Ginger**

*Ginger* (*Zingiber officinale*) is a flowering plant. **Ginger** (Figure 6) belongs to the family of *Zingiberaceae*. Anticancer activities of ginger against colorectal cancer have been well documented. Numerous *in vitro* studies showed that *ginger* and its active components inhibit growth and proliferation of colorectal cancer cells. In a study, 6-gingerol inhibited growth of colon cancer HCT116 cells. Whole ginger extract also prevents the primary stage of colon carcinogenesis. Administration of ginger extract to the mice pre-treated with carcinogen 1,2-dimethylhydrazine (DMH) inhibited the levels of faecal bile acids, neutral sterols, tissue cholesterol, HMG CoA reductase, free fatty acids, triglycerides, phospholipase A, and phospholipase C. Thus, *ginger* supplementation reduced the risk of colon

cancer markedly by virtue of its hypolipidemic and antioxidative effects [21].

### **Strawberry**

Strawberries are not berries in the botanical sense Strawberry (Figure 7) belongs to the family of *Rosaceae*. *Strawberry* and black raspberry have been shown to have potential cancer prevention effects with low toxicity profiles in IBD-related CRC. Inflammation-induced carcinogenesis has been associated with oxidative stress, genomic instability, immune effectors, cytokine dysregulation, and the NFκB signaling pathway. In contrast to anti-inflammation pharmaceuticals, strawberry and black raspberry interventions have shown to have a synergistic role in multiple molecular events, including suppressing cytokines release, decreasing oxidative stress,

reducing genomic instability, and inhibiting NF $\kappa$ B and related signalling pathways. The chemo preventive activity of strawberry and



Figure 7 : Strawberry

### Ginseng

*Ginseng* is peeled and air-dried *ginseng*. It belongs to the family of *Araliaceae*. Colorectal cancer can be controlled to some extent via a healthy diet rich in fruit and vegetables. *Ginseng* (Figure 7) is a plant which has been consumed as herbal medicine for thousands of years in Asian countries. Several in vitro and in vivo studies have shown that this plant not only reduces the incidence of colorectal cancer, but also improves patient's status by enhancing the effects of chemotherapy drugs. Briefly review ginseng and its components such as ginsenosides reported anticancer effects and their mechanisms of action [23].

### CONCLUSION

Chemotherapy and other modern cancer treatment methods are believed to have limited potential due to their toxicity, high expense, and inability to distinguish between cancer cells and healthy cells. The herbal-derived chemotherapeutic agents have long been used to treat cancer. Medicinal plants remain the main ingredients of indigenous medicines. This review has shown the medicinal plants those are helpful for the prevention and treatment of Colorectal Cancer. The chemical constituents of these plants are excellent candidates to combat the rising incidence of acquired drug resistance in cancer therapy.

black raspberry is likely due to multiple nutrients and bioactive, especially anthocyanins [22].



Ginseng

**Declaration by Authors** A thorough review of the literature was conducted, the information was acquired and reviewed on all the discussed plants. The above work is totally collected from review articles

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