



Uses of Cornus Species in Alternative Medicine: Minireview

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Abstract:

Background: Despite the wide range of synthetic drugs, natural way of treatment in traditional medicine always remained valuable. **Objectives:** In this review article, plants of *Cornus* species along with their beneficial uses as healing mixture in traditional medicine has been studied and discussed.

Methods: Literature was searched through Google Scholar, Science Direct and Cochrane database etc. **Discussion:** *Cornus* species consists of almost 65 plants. Plants belonging to this cornaceae family typically are trees or shrubs. They all play different roles in different ways. Some plants are being used in horticulture for decoration and in gardening purpose. Few plants with their medicinal uses are described in this paper. Different plants have different action against different diseases as anti-proliferators, anti-diabetic, anti-oxidant, anti-inflammatory, tumor cell proliferation inhibition, cyclooxygenase enzymes inhibition, lipid peroxidation, inhibition of nitric oxide production, anti-fungal, anti-bacterial, anti-viral, anti-plasmodial, anti-microbial and oxygen free radical scavenging activity. **Conclusion:** This review indicates that use of natural extracts in medicine or treatment with plants and medicinal herb is considered best due to their cost effectiveness, minimal or no side effects and better action in their target site.

Keywords: Cornaceae family, Traditional medicine, Biological activities

Key Message: Different plants have different action against different diseases as anti-proliferators, anti-diabetic, anti-oxidant, anti-inflammatory, tumor cell proliferation inhibition, cyclooxygenase enzymes inhibition, lipid peroxidation, inhibition of nitric oxide production, anti-fungal, anti-bacterial, anti-viral, anti-plasmodial, anti-microbial and oxygen free radical scavenging activity.

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Introduction

The genus *Cornus*, commonly known as dogwoods, are woody plants belonging to the family *Cornaceae*. The word *Cornus* is derived from the Latin word which means horn. Dogwood is an indigenous tree of 12-30 feet in height and also called tree of tardy growth. In the *Cornus* genus, there are almost 55-65 plants, some woody evergreen plant species. *Cornus* species is classified according to molecular phylogeny into four sub-groups and ten sub-genera. Few of them are perennial shrubs. Most of the *Cornus* species are shrubs and are deciduous trees. In some species, flowers are surrounded by white petals and the leaves are curved, while most of the species have alternate leaves and the remaining with opposite leaves. The fruit of *Cornus* species plants *Cornus kousa*, *Cornus mas*, *Cornus controversa* and *Cornus officinalis* is edible and sweet in taste. *Cornus* species. It is revealed from the studies that anthocyanin is present in the fruit of plants belonging to *Cornus* species. The wood of the plants belonging to this species is anodyne and the stem is used for the treatment of dysentery. Americans mostly used dogwood for the treatment of fever, headache and for wound healing. The bark of this species contains tannin which is used as a substitute for quinine and used in traditional medicine. For wound healing, leaves of this species are used. In China, for several minor ailments, dogwood is mostly used (Hassanpour, Yousef et al. 2011). They are distributed in Southeastern United States, Turkey, China, Eurasia, North America and Japan. Most of the plants are used in ornamental purposes; few are used as plant food for insects, larvae of butterflies and moths (Forman, Bukovský et al. 2016). Some plants have biological activities and are in medicine for the treatment of many diseases (Table 1). This species is used in traditional medicine due to its anti-inflammatory, anti-oxidant, anti-viral, anti-bacterial, anti-fungal, anti-microbial, anti-plasmodial, anti-diabetic, anti-proliferative, and lipid peroxidation activity (Fu, Liu et al. 2014). They also play a role in nitric oxide production inhibition. They play anti-inflammatory activity by inhibiting nitric oxide production and cyclooxygenase production. They also play anti-amnesic activity by enhancing cognition through its action on the hippocampus.

Anti-cancer activity is exhibited by tumor cell proliferation inhibition. Anti-diabetic role is achieved by decreasing the insulin resistance or by enhancing insulin production. Different parts of *Cornus* species' such as roots, bark, leaves and aerial parts are being used for the extraction of bioactive compounds.

Cornelian Cherry Species

Cornelian cherry (*Cornus mas*) also called European cornel or cornelian cherry dogwood is a woody and flowering plant of dogwood. It belongs to the *Cornaceae* family. It is distributed in Turkey, Southern Asia and Europe. It is found as a small tree or shrub ranging from medium to large. It grows five to twelve meters large with green twigs and brown branches. On ripening, the fruit of this plant resembles the berries of coffee. Fruit is edible but unripe cannot due to astringent taste. Taste of its ripen fruit is acidic and due to acidic taste it is used in jam formation and for making sauce. Flowers of its plant with yellow petals and cluster shape are used for ornamental purposes. Fruit extract and its chemical constituents have anti-oxidant and anti-proliferative activity. Phenol, anthocyanin, ascorbic acid, flavonoid, cyanin, proanthocyanin and gallic acid are its chemical constituents. Gallic acid and ascorbic acid have strong anti-oxidant activity. They play their anti-oxidant activity by reducing power and scavenging free radicals, super-oxides ion radicals and hydrogen peroxide. They also play a role by inhibiting the lipid peroxidation (Tural and Koca 2008). The fruit extract of this plant has chelating activity (inhibit the bonding between the bonds) so by inhibiting bonding it inhibits the bond and free radical formation (Ersoy, Bagci et al. 2011). Traditionally, cornelian cherries are also used for the treatment of digestive problems, enhance the function of liver and kidney and for the treatment of fever and inflammation (Bertová 1984).

Cornus alba

Cornus alba is widely distributed to Korea, Siberia and China. It is a flowering plant of dogwood species of *Cornaceae* family. It grows 3 meters or 10 feet high. Flower of this plant are white in color and due to the color of flower it is called white flower dogwood. Fruit of this plant is

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edible. Extract of this plant is used as anti-proliferative for human breast cancer and prostate tumor. Chemical constituents of this plant are morroni side, betulinic acid, non-polar compound, anthocyanin, polyphenols, delphinidin 3-o-glucoside and delphinidin 3-o-rutinoside which are responsible for anti-proliferative activity. They play their anti-proliferative activity by inducing apoptosis, modulation of critical enzymes and by producing anti-oxidant activity. Due to anti-oxidant activity, it inhibits the formation of radicals which are oxygen centered and upon reacting with oxygen form free radical that causes damage to the cell which leads to cancer. They also inhibit the production of damaged DNA which if remain persistent will lead to the production of damaged cell (Szliszka and Krol 2015). The polyphenols of this plant activate the TNF (tumor necrosis factor) and gallic acid causes death of selective cancerous cells (Pietta, Minoggio et al. 2003). Leaves extract of this plant inhibit the growth of cells which are responsible for breast cancer.

Cornusamonnum

The silky dogwood *Cornusamonnum*, also called kinnikinnik, red willow and silky cornel. This is a deciduous plant with opposite leaves and blue color fruit. It is divided into 2 species. It is shrub of *Cornus* species usually 12 feet in height. *Cornusamonnum* is native in North America, it is also called North American shrub. Ethanolic extract of its leaves, stem, and roots are used as anti-microbial agent. Anti-microbial agents are used for the treatment of many diseases which results from the resistance of microorganisms. It has potential against candida albicans, *E. coli* and staphylococcus aureus. In traditional medicine it is used for the treatment of burning micturition, painful urination and chest congestion. the bark of this plant play role in control of sexually transmitted diseases such as gonorrhea. Tannins, flavonoids, poly phenols, terpenoid found in this plant also have anti-bacterial and anti-viral activity (Borchardt, Wyse et al. 2008). They also have immunomodulatory activity by enhancing leukocyte count and by increasing the phagocytic activity, by which infectious organism and pathogens are killed and prevented from disease that they may cause (Forman, Bukovský et al. 2016).

Cornusofficinalis

Cornusofficinalis also known as Japanese cornel or Japanese cornelian cherry. This plant is distributed in China, Japan and Korea. In Chinese traditional medicine it has been used from centuries for the treatment of several diseases. Methanol extract of this plant has effect on auditory cells and prevent them. Ethanolic extract of this plant protect the liver from injury. Fruit of this plant is called shanzhuyu, used in diabetic nephropathy (Ma, Wang et al. 2014). From the fruit of *Cornusofficinalis*, gallic acid was separated (Tian, Zhang et al. 2000) which is used for the treatment of cancer, diabetes and play best therapeutic role against free radicle damage. From the leaves of this plant gallotannin is obtained (Bhakta, Park et al. 2017) which is formed from gallic acid and has role in beeding control. Triterpenoids, tannins, polysaccharide, flavonoids and organic acids are the main chemical constituents and possess anti-oxidant, anti-diabetic and neuro protective activity. It plays its anti-diabetic activity by inhibiting the expression of FN, interleukin -6 and collagen 4. It plays anti-amnesic role and enhance cognition by effecting on hippocampus. It is revealed from studies that methanolic extract collected from the *Cornusofficinalis* fruit play anti-amnesic activity and major constituent responsible for anti-amnesic activity is loganin (Lee, Sung et al. 2009). Extract collected from fruit has effect on beta cells and play protective role. This plant shows anti-diabetic activity through inhibiting the alpha-glucosidase enzyme and control hyper-glycaemia. Iridoid is an active constituent of this plant which possesses neurogenesis and angiogenesis to enhance or regulate the neuronal function. It is also used for the treatment of erectile dysfunction (Lee, Hwang et al. 2003, Lee, Sung et al. 2009, Telang, Li et al. 2012). Hepatocellular carcinoma which is a fetal condition if remain untreated and has controlled and treated efficiently by inhibiting the proliferation of neoplastic with the water extract of *Cornusofficinalis* (Chang, Chiang et al. 2004).

Cornusflorida

The flowering dogwood, *Cornusflorida* is a deciduous tree belonging to cornaceae family. The leaves are opposite, flowers are yellowish green and fruit in the form of cluster. This is commonly grown ornamental plant. Betulinic acid, beta-

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sterols, ursolic acid, regosta-4,6,8,22-tetraene-3-one, 3beta-o-cis-coumaroyl betulinic acid, 3-epideoxyflindissol and 3beta-o-tran-coumaroyl betulinic acid are the active chemical constituents that possess anti-plasmodial activity against plasmodium falciparum (which is a parasite, a unicellular protozoon, transmitted through bite) that causes malaria in humans. *Cornusflorida* also possess anti-leishmanial activity against leishmaniarentolae (that causes leishmeniasis in human (Graziose, Rojas-Silva et al. 2012).major anthocyaninscyanidine 3-o-glucoside 4, cyanidine 3-o-glucoside 6 are obtained from *Cornusflorida* which has free radical scavenger activity, possess strong anti-bacterial, anti-viral and anti-inflammatory activity. For the treatment of urinary tract infection anthocyanin from *Cornusflorida* has been used in traditional medicine as best therapeutic. It has been stated that it has 78 percent lipid peroxidation activity and through this activity it destroys free radicals and prevent from oxidative stress. Through cyclooxygenase inhibition inflammation is controlled and it possess this activity about 68 percent(Vareed, Reddy et al. 2006). From the methanolic bark extract of *Cornusflorida*, Molluscicidal saponins are obtained having role in increasing immunity and prevention from cancer(Hostettmann, Hostettmann-Kaldas et al. 1978).

Cornuschinnensis

Cornuschinnensis is a shrub or deciduous plant. Different parts are used for different diseases and have different activities (Table 2).

Cornuseydeana

Cornuseydeana is a dogwood species belonging to cornaceae family. It is known as new species of *Cornus* or cornelian cherry. It has resemblance to other plant of *Cornus* species due to the shape of its fruit and different from other due to flower, evergreen nature and leathery leaves (Yu-Min Shui and Zack Murrell, 2003). It is a small and deciduous tree, possessing anti-viral activity against herpes simplex virus. Methanol extract of this plant have direct effect on virus, inhibiting the replication of virus and kill them(Legault, Pichette et al. 2016).

Cornuscanadensis

The flowering plant, *Cornuscanadensis* belonging to cornaceae family is distributed in Greenland, China, Northern United States, and North east China. It is a native plant and is an edible shrub. This is a perennial creeping plant. In traditional medicine for many diseases different form of this plant are used. Pectin is an active constituent of this plant obtained from the fruit of this plant and possess multi-activities in traditional medicine(McCutcheon, Ellis et al. 1992, McCutcheon, Ellis et al. 1994).Iridoid glycosides are obtained from *Cornuscanadensis* which prevent from insects. Saponins containing in this plant play vital role in neoplastic cells proliferation inhibition and tannins play important role against many diseases and traditionally used in traditional medicine (Table 3).

Cornuswalteri

Cornuswalteri is a deciduous shrub belonging to cornaceae family. It is also known as walter's dogwood. The extract collected from this plant possesses the nitric oxide inhibition activity. Nitric oxides are intracellular molecules and short-lived free radicals which are produced by the activity of nitric oxide synthetase enzyme consisting on endothelium, platelets, macrophages, fibroblast, neutrophils, neuronal cells and smooth muscle cells. Production of nitric oxides leads to the formation of inflammation.*Cornuswalteri*'s extract by inhibiting the nitric oxide synthetase control the formation of nitric oxides (Yang, Yim et al. 2009).*Cornuswalteri* contain triterpenoids that play role in prevention from cytotoxic cells. *Cornuswalteri* is used in natural medicine for the treatment of testicular benign hyperplasia due to its anti-oxidant activity from polyphenol, flavonoid and ethanolic extract. The cytoprotective role was seemed positive after test results (Kim, Hwang et al. 2013). Bark extract of *Cornuswalteri* used in lipid lowering and peroxide inhibition. It was tested on hyperlipidemic rat and after testing on them it was revealed that *Cornuswalteri* give best and positive result (Park and Cha 2009).

Cornusdisciform

The dogwood, *Cornusdisciform* is a small, deciduous shrub. It belongs to cornaceae family. Kaempferol 3-o-rhamnoside, myricetin 3-o-

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rhamnoside, Kaempferol 3-o-glucoside, Cronin, ursolic acid, stenophyelin, beta sterols are the active constituents of this plant which have different way of action for the treatment of many diseases. The constituents of this plant possess the Lipid peroxidation, inhibit cyclooxygenase enzyme activity, tumor cell proliferation inhibitor activities.

Cornuscircinate

It is called as rounded leaves and it grows from 6-7 feet in height with greenish branches. Leaves are

usually large, orbicular with weaved on edge. Flowers are white in color; fruit consist of berries of bright blue color. The plant is native in North America, Canada and west in Missouri. The bark is greenish or greyish in color when become dried. In traditional medicine it is used for the treatment of sore throat, dysentery, diarrhea and dyspepsia. Due to the tonic properties it is used for the treatment of typhoid fever, malignant fever and used as anti-septic. For vomiting due to pregnancy and any diseases of uterus infusion of this plant is highly recommended (Ma, Wang et al. 2014)

Table 1: Medicinal Plants of Cornus Species

Plants name	Chemical constituents	Uses	References
<i>Cornusmas</i>	Tannic acid, Ascorbic acid, Phenolic, Anthocyanin	Anti-oxidant activity (Hassanpour <i>et al.</i> , 2011)	(Tural and Koca 2008)
<i>Cornusalba</i>	Anthocyanin, Gallic acid, Cyanidin, glucopyronoside, delphinidin 3-di- o-beta	Anti-proliferative activity and immunomodulatory activity	(Bjorøy <i>et al.</i> , 2007)
<i>CornusOfficinalis</i>	Methanolic extract, loganin, Oleanolic acid, ursolic acid, ethanolic extract	Anti-amnesic activity, enhance cognition, effect on auditory cell, prevent hepatic injury, have protective effect on beta cell, promote neurogenesis and angiogenesis, enhance the motility of human sperm	(Seeram <i>et al.</i> 2002)
<i>Cornusflorida</i>	Iridoidglucosides, terpenoids, flavonoids, Anthocyanin	Anti-plasmodial activity, Anti-diabetic activity, Anti-oxidant activity, Anti-inflammatory activity	(Vareed <i>et al.</i> , 2006)
<i>Cornusamomum</i>	Ethanolic extract collected from leaves, tennins, terpenoids, essential oils, flavonoids and poly phenols.	Immune-modulatory, Anti-microbial, anti-bacterial and anti-viral activity	(Ma <i>et al.</i> , 2010)
<i>Cornuschinensis</i>	Methanolic extract	Oxygen scavenging Activity	(Fu <i>et al.</i> , 2014)
<i>Cornuseydeana</i>	Extracted from different parts	Anti-viral activity against herpes simplex virus inhibition	(Shui and Murrell 2003)
<i>Cornuscanadensis</i>	Extract from roots and aerial parts	Anti-fungal activity	(Stermitz and Krull 1998)
<i>Cornuswalteri</i>	Extract	Inhibit nitric oxide	(Kim <i>et al.</i> , 2010)

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		production	
<i>Cornusdisciform</i>	Kaempferol 3-o-rhamnoside, myricetin 3-o-rhamnoside, Kaempferol 3-o-glucoside, ursolic acid, stenophyelin, sterols.	Lipid peroxidation, inhibit cyclooxygenase enzyme activity, tumor cell proliferation inhibitor	(Xiang <i>et al.</i> 2006)

Table 2: Phytotherapeutic activities of different parts of *Cornus* Species

Parts	Uses	References
Fruit	Hepato-protective, In heavy menstrual bleeding, in Spermatorrhoea, premature ejaculation, anti-bacterial activity, anti-viral, anti-tumor, anti-fungal, diuretic and hypotensive activity.	(Legault <i>et al.</i> , 2016)
Fruit without seeds	Used for the treatment of arthritis, fever, cystitis and diabetes.	(Ma <i>et al.</i> , 2014)
Stem	Anti-malarial, astringent and tonic.	(Graziose <i>et al.</i> , 2012)
Plant as whole	Anti-bacterial, hypotensive, as urinary anti-septic and best diuretic.	(Ma <i>et al.</i> , 2010)

Table 3: Phytotherapeutic application of *Cornus* species

Plant part/form	Uses	References
Leaves and stems of plant	used as an analgesic, for cathartic and febrifuge	(Stermitz and Krull 1998)
Tea made from this plant	Used for aches and pain, used in the treatment of lungs and kidney ailments, for cough and fever	(Stermitz and Krull 1998)
Decoction	Effective in eye wash, treat the infant colic.	(Stermitz and Krull 1998)
Fruit	Has anti-inflammatory activity, anti-oedemic activity, anti-spasmodic activity, capillary tonic, protect against radiations and inhibit the carcinogenesis.	(Ma <i>et al.</i> , 2014)
Mashed roots of plant	Remove foreign objects from eyes and used as eye wash for sore eyes.	(Ma <i>et al.</i> , 2014)

Conclusion

Many synthetic drugs are produced and almost all types of synthetic drugs have formed for all types of diseases but natural way of treatment has valuable role for treating diseases and always preferred due to its effective cure rate. In *Cornus* genus, 55-65 species of plants are present. Most of the species are small tree or deciduous herb, used as food for insects, for ornamental purposes, in horticulture and in traditional medicine. The treatment is carried out by chemical constituents

of plants extract collected from leaves, barks, stem and aerial parts of plant, tea from root, whole plant and decoction. Different parts of plant have different way of action and used in specific diseases.

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