

# ALL ABOUT SUPPLEMENTS

## Bilberry

For many centuries, herbalists have recommended bilberry (*Vaccinium myrtillus*) for strengthening vision and treating health conditions such as diarrhea, constipation, and kidney stones. Recent research findings suggest that bilberry possesses an even broader spectrum of therapeutic properties, owing in part to its content of healing phytochemicals called anthocyanins.

### Antioxidant Power of Anthocyanins

Anthocyanins (from the Greek words for “plant” and “blue”) are the universal, water-soluble colorants responsible for the red, purple, and blue hues seen in many fruits, vegetables, and flowers. Scientists have identified more than 600 anthocyanins, and every fruit and vegetable has a distinct anthocyanin profile with a specific distribution pattern. Anthocyanin levels range from 0.25 mg per 100 grams fresh weight in pears to 500 mg per 100 grams fresh weight in blueberries. Fruits that are richest in anthocyanins are strongly colored (dark blue, purple, or black) berries like the bilberry.<sup>1</sup>

Studies show that bilberry’s anthocyanins promote human health by fortifying blood vessel walls. This helps improve blood flow to the tiny blood vessels that keep eyes healthy, as well as to larger blood vessels that help maintain optimal circulation throughout the body. Furthermore, these phytochemicals strengthen collagen, a critical component of the structure of skin, tendon, bone, cartilage, and other connective tissues.<sup>2</sup>

Anthocyanins belong to the larger group of plant polyphenols called flavonoids, which comprises about 4,000 compounds responsible for the colors of fruits and flowers. Flavonoids are powerful antioxidants that help defend the body against internal and external stressors. Antioxidants counter the effects of normal aging and disease processes by neutralizing free radicals, the unstable, often oxygen-rich chemicals produced by the body. Potentially harmful free radicals are generated as by-products of oxidation (the cellular process of burning fuel) and have one or more unpaired electrons, which makes them highly reactive. Free radicals can damage DNA and mitochondria—critical components of all tissues—by altering their chemical structure. Antioxidants appear to neutralize the destructive effects of free radicals, thus reducing the risk of some chronic diseases.<sup>3,4</sup>

Flavonoids such as those found in bilberry also help prevent LDL (low-density lipoprotein) oxidation and improve endothelial dysfunction, which is often a precursor to atherosclerosis and thrombosis.<sup>5</sup> Endothelial dysfunction results from oxidative damage to the endothelial cells lining the inner surface of arteries and veins, which leads to a buildup of plaque that can narrow or block blood vessels. Bilberry is rich in other phenolic compounds that help protect against both lipid and protein oxidation.<sup>4,6</sup>

### Rich in Quercetin and Resveratrol

Bilberry is a rich source of quercetin, a bioflavonoid that helps strengthen capillaries. Studies have shown that quercetin and other flavonoids modify anti-inflammatory responses, prevent LDL oxidation and platelet aggregation, and promote the relaxation of cardiovascular smooth muscle. These actions may help to prevent cardiovascular conditions such as atherosclerosis, hypertension, and arrhythmia.<sup>7</sup>

Quercetin may help prevent diabetic cataract, which produces clouding of the eye lens.<sup>8</sup> Diabetic cataract is caused by elevated sorbitol within the eye lens, which is then catalyzed by aldose reductase, an enzyme normally present in the eye and other parts of the body. Researchers have found that quercetin and its derivatives are potent inhibitors of aldose reductase.

Moreover, the berries from this low-growing deciduous shrub native to northern Europe are packed with resveratrol, a natural antioxidant with anti-inflammatory, anti-tumorigenic, and immunomodulatory actions. Resveratrol is both chemopreventive and chemotherapeutic.<sup>9</sup> Chemoprevention attempts to use natural and synthetic compounds to intervene in cancer’s early stages, before invasive disease begins. Chemopreventive agents can prevent or stop genetic mutations that lead to cancer as well as processes that lead to excessive replication of damaged cells.<sup>10</sup> In vivo, resveratrol has been shown to block the multi-step process of carcinogenesis at various stages and to suppress tumor initiation, promotion, and progression.<sup>11,12</sup>

Resveratrol offers other benefits as well. As a phytoestrogen—that is, a substance that mimics some of the effects of estrogen but without its harmful side effects—resveratrol has neuroprotective and chemoprotective properties.<sup>13</sup> In comprehensive studies, resveratrol has been shown to bind to estrogen receptors, which may offer protection against tumor growth.<sup>12</sup>

In addition, bilberry is a rich source of other bioactive compounds that inhibit the growth of harmful microorganisms such as viral

and bacterial pathogens.<sup>14</sup>

Like blueberries and cranberries, bilberry fruit is loaded with tannins (proanthocyanidins), astringent-like chemicals that help strengthen capillaries and connective tissue. Proanthocyanidins have unique molecular structures that exhibit potent bacterial anti-adhesion activity.<sup>15</sup> Tannins, which are also plentiful in black but not green tea, have soothing anti-inflammatory effects on the gastrointestinal tract, and several studies suggest that tannins may prevent oral diseases and dental cavities.<sup>16</sup>

## **Bilberry's Other Beneficial Effects**

Bilberry products are used in Europe to promote enhanced vision. Anthocyanins and other healing compounds in bilberry help reduce the permeability of tiny blood vessels called capillaries while increasing capillary resistance. Bilberry's vasoprotective action improves visual function, increases blood flow to the vessels of the eyes, protects the retinas of the eyes, and enhances the production of rhodopsin, a protein necessary for near vision.<sup>8</sup>

Oxidative damage from sunlight and smoking increases the risk of cataracts and macular degeneration, a disease of the retina that can lead to blindness. Bilberry's antioxidant activity and collagen-stabilizing actions have been reported to be useful in preventing and treating ophthalmologic disorders such as diabetic retinopathy, macular degeneration, and cataract.<sup>17</sup>

Because bilberry reduces the fragility of capillaries and supports the formation of new capillaries, it may benefit individuals with a condition called chronic venous insufficiency, a condition similar to varicose veins that is marked by symptoms of edema, skin changes, and venous ulceration. Chronic venous insufficiency may be caused by failure of the lower leg veins to work efficiently.

In Germany, bilberry fruit is used to treat mild cases of diarrhea as well as mouth and throat inflammation.<sup>18</sup> It is also used to inhibit various inflammatory mediators, including histamine, proteases, leukotrienes, and prostaglandins. Limited research suggests bilberry may reduce symptoms associated with premenstrual syndrome and improve fibrocystic diseases of the breast.

While most scientific trials have focused on bilberry's berry component, bilberry leaves may likewise have beneficial properties. Findings indicate that a compound called glucoquinine, which is found in bilberry and other berry leaves, helps to lower blood sugar levels and thus limit glycation.<sup>19</sup> Glycation is a pathological process that occurs when glucose binds to protein molecules and alters both their structure and function, resulting in the formation of non-functioning proteins in the body. Higher blood glucose levels lead to more damaging glycation reactions and increased oxidative stress.<sup>20</sup> Glycation is implicated in macromolecular damage and biochemical changes that occur with aging and age-related disorders.<sup>21</sup> While glycation accelerates aging and diseases such as cataract and atherosclerosis, lowering blood sugar levels may reduce the risk of these chronic illnesses and slow the physiological aging process.

## **Berry Extracts Fight Cancer**

The process of angiogenesis is essential for invasive tumor growth and metastasis, and thus represents a critical juncture in controlling cancer development. The most important factor controlling angiogenesis is vascular endothelial growth factor. In a study published in the journal *Free Radical Research*, scientists who compared six berry extracts—wild blueberry, bilberry, cranberry, elderberry, raspberry seed, and strawberry—and a grape seed proanthocyanidin extract concluded that edible berries have potent chemopreventive properties. Of the fruits studied, extracts of wild bilberry and blueberry possessed the greatest antioxidant activity, though all the fruits were found to impair angiogenesis.<sup>22</sup>

A Japanese study published in 2003 concluded that among extracts of 10 edible berries, bilberry extract was the most effective in inhibiting the growth of human leukemia and colon cancer cells by inducing apoptosis (programmed cell death) *in vitro*. Of the extracts tested, bilberry extract contained the most phenolic compounds (including anthocyanins) and exhibited the greatest activity in scavenging free radicals.<sup>23</sup>

In a cluster of studies, Indiana University researchers studied the effects of bilberry, chokeberry, and elderberry on coronary arteries. They found that berry extracts, in concentrations likely to be found in the human bloodstream after ingesting these compounds, can increase the availability of nitric oxide, leading to improvement in the coronary arterial system. Factors that promote the arterial endothelial nitric oxide system and suppress oxygen free radical formation are thought to offer substantial cardiovascular and disease-preventive benefits.<sup>24</sup>

## **Conclusion**

A wealth of scientific studies confirms that bilberry may hold numerous benefits for those seeking to optimize their health and well-being. Bilberry's rich content of anthocyanins, quercetin, and resveratrol may offer targeted protection for the eyes, blood vessels, and the cardiovascular system. Additionally, some studies suggest that bilberry may help ward off infection and help protect against cancer.

Bilberry appears to be safe and has no known drug interactions. A suggested supplemental dose is one 100-mg capsule daily (or as recommended by your health care professional) of a bilberry extract standardized to contain 25% anthocyanins.

**Editor's note:** Blueberries and other berry fruits contain many of the same bioactive phyto-nutrients found in bilberry.

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