The Longwood Herbal Task Force
(http://www.mcp.edu/herbal/default.htm) and
The Center for Holistic Pediatric Education and Research
(http://www.childrenshospital.org/holistic/)

Bilberry (*Vaccinium myrtillus*)

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**Principal Proposed Uses:** Ocular disorders; mild, non-specific diarrhea

**Other Proposed Uses:** Oral irritations, vascular disorders

**Overview**

The major American use for bilberry fruit is to treat ocular disorders; it is used to aid night vision, prevent the development and progression of cataracts, treat diabetic retinopathy and macular degeneration, and prevent glaucoma. European herbalists also rely on bilberry to treat mild diarrhea and mild oral irritation. Its constituents include tannins, anthocyanosides and flavonoids. There are actually very few scientific studies evaluating bilberry’s physiologic effects in humans; most of these are case series and few are published in English. Bilberries are eaten as food and are presumed to be safe for use with other medications and during pregnancy, lactation and childhood. However, the results of some animal studies suggest that patients with diabetes and those taking anticoagulants should be closely monitored if they begin consuming large quantities of bilberry extract.

**Historical and Popular Uses**

Bilberry is often referred to as the European blueberry and has long been eaten in jams, pies, cobblers and cakes. It also enjoys a long medical history. Hildegard of Bingen, the famous Fifteenth Century nun, musician and herbalist, recommended bilberry to induce menses. It has been used historically as a treatment for fevers, coughs, renal stones and urinary tract infections, intestinal and liver disorders, hemorrhoids, and infections of the skin and mucus membranes. It was also used to treat a variety of eye disorders including myopia, eyestrain, impaired night vision and cataracts.
During World War II, bilberry became popular among the pilots of Britain’s Royal Air Force (RAF); they claimed that eating bilberry jam prior to nighttime bombing raids improved their vision\(^1\). Nowadays, bilberry is widely used in Europe for the prophylaxis and treatment of a variety of ocular disorders including cataracts, diabetic retinopathy, glaucoma, macular degeneration, and impaired night vision. Some European surgeons recommend it prophylactically to enhance the healing of surgical wounds. Herbalists recommend it as a vulnerary to prevent and treat bruising, hemorrhoids, varicose veins and a variety of vascular disorders. A decoction of the berries has traditionally been used for diarrhea, and an infusion from the leaves has been used for urinary tract infections\(^2\)-\(^4\). In 1997, bilberry products were among the top 20 for herb sales in the US\(^5\).

**Botany**

*Medicinal species: Vaccinium myrtillus.* There are over 400 other Vaccinium species including blueberry (*V. angustifolium*) and cranberry (*V. macrocarpus*).

*Common names:* Bilberry, blaeberry, heidelberry, huckleberry, hurtleberry, whortleberry

*Botanical family:* Ericaceae

*Plant description:* Bilberry is a one-foot tall, thickly branched, deciduous perennial shrub, closely related to the blueberry. The plant flowers in late spring; the fruit is ripe between July and September. The berries are black, juicy and coarsely wrinkled, with purple flesh and brownish-red seeds. Both the berries and leaves are used medicinally; the leaves are used like uva ursi to prevent and treat urinary tract infections\(^6\).

*Where it’s grown:* Bilberry is native to northern and central Europe and northern North America. It is now grown in eastern Europe, the former USSR, Poland and Albania. It grows well in woods and moist meadows.
**Biochemistry**

**Bilberry: Potentially Active Chemical Constituents**

- Flavonoids: hyperoside, isoquercitrin, quercitrin, astragaline
- Anthocyanosides (myrtillin, malvidin, cyanidin, delphinidin and others)
- Catechin tannins (2-10%)
- Others: carbohydrates including invertose, organic acids, pectins, alkaloids

Bilberry’s bioflavonoids are potent antioxidants, scavenging free radicals and reducing inflammation. Bilberry is similar in its antioxidant effects to green tea, grape seed extract, pine bark extract and ginkgo. Bilberry’s flavonoids appear to reduce capillary permeability and fragility, possibly by supporting the surrounding connective tissue and endothelium. At high doses, flavonoids can impair platelet aggregation and affect clotting times.

Bilberry contains at least 15 different anthocyanosides which are flavonoid derivatives of anthocyanins, the blue and red pigments found in many leaves and fruits including cranberries, huckleberries, strawberries, blueberries, black cherries, red grapes, raspberries, and red cabbage. These compounds are also antioxidants that appear to enhance collagen cross-linkages, promote collagen synthesis, and inhibit collagen degradation, thereby stabilizing connective tissue. They are stable in boiling water and in dry heat for many days.

Bilberry’s combination of antioxidant and collagen stabilizing effects would suggest that it might be a helpful vulnerary (wound healing agent) and has led to its use in treating microvascular disorders in which inflammation and collagen degradation play a role.

Tannins are used medicinally as astringents and to treat diarrhea. When tannin concentrations exceed 10%, they may cause significant gastrointestinal distress; amounts in bilberry are typically less than 10%.
Experimental Studies

### Bilberry: Potential Clinical Benefits

1. **Cardiovascular:** Vasoprotective  
2. **Pulmonary:** none  
3. **Renal and electrolyte balance:** none  
4. **Gastrointestinal/hepatic:** Antidiarrheal, antiulcer  
5. **Neuropsychiatric:** Cataracts, diabetic retinopathy and macular degeneration, impaired night vision  
6. **Endocrine:** Diabetes  
7. **Hematologic:** Inhibition of platelet aggregation (See Cardiovascular)  
8. **Rheumatologic:** none  
9. **Reproductive:** none  
10. **Immune modulation:** Anti-inflammatory  
11. **Antimicrobial:** Urinary tract infection (see Cranberry), antiviral  
12. **Antineoplastic:** Antineoplastic (experimental use)  
13. **Antioxidant:** Antioxidant  
14. **Skin and mucus membranes:** Vulnerary  
15. **Other/Miscellaneous:** none

**NOTE:** Most of the research on bilberry is not available in English. Most studies are cited here based on English translations of the abstracts only.

1. **Cardiovascular:** Vasoprotective
   
   i. *In vitro data:* Bilberry’s anthocyanosides (also called *Vaccinium myrtillus* anthocyanosides, or VMAs) induced relaxation and dilation of coronary and systemic arteries in one Italian study\(^22\); anthocyanosides counteracted the contractile responses to acetylcholine in another study\(^23\). High doses of anthocyanosides also inhibited platelet aggregation *in vitro*\(^15\), 24-26.
   
   ii. *Animal data:* Anthocyanosides decreased vascular permeability in rabbits with cholesterol-induced atheromas by enhancing collagen cross-linking\(^27\). Pretreatment with anthocyanosides preserved the blood-brain barrier in rats with induced hypertension,
limiting the typical vascular permeability normally caused by hypertension\textsuperscript{14}. In the animal model of ischemia/reperfusion injury, pretreatment with bilberry extracts significantly decreased microvascular impairment\textsuperscript{28}.

In rat studies, bilberry’s anthocyanosides promoted increased rhythmic contraction of arterioles, enhancing microvascular blood flow in striated muscles\textsuperscript{29}.

iii. Human data: In a case series of 47 adults with a variety of circulatory problems (atherosclerosis, a tendency to bruise easily, hemorrhoids and varicose veins), bilberry extracts reportedly improved circulation and reduced symptoms\textsuperscript{16}. These studies have been interpreted by some herbalists to mean that bilberry is a useful treatment for circulatory problems and for dysmenorrhea.

2. Pulmonary: none

3. Renal and electrolyte balance: none

4. Gastrointestinal/hepatic: Antidiarrheal, antiulcer

a. Antidiarrheal: This traditional European remedy for both adult and pediatric diarrhea has not undergone scientific evaluation, but could be rationalized based on the modest tannin content of the berries\textsuperscript{3, 5, 30-32}.

b. Antiulcer

i. In vitro data: none

ii. Animal data: When lab animals were given large doses of one of bilberry’s anthocyanosides (600 mg BID of IdB 1027 [cyanidin chloride] for ten days), there was a significant increase in gastric mucosal release of the anti-inflammatory prostaglandin E\textsubscript{2}\textsuperscript{33}. In animals with experimental models of acute and chronic ulcers that were treated with the same compound, antiulcer activity was observed\textsuperscript{34, 35}.

iii. Human data: There are no controlled trials evaluating the effects of bilberry in treating gastric or duodenal ulcers in adults or children.

5. Neuropsychiatric: Cataracts, diabetic retinopathy and macular degeneration, impaired night vision. Bilberry is used for multiple ocular disorders; in Italy, bilberry’s anthocyanosides have even been recommended as a treatment for myopia\textsuperscript{36}. Bilberry’s benefits have been attributed to its effects on microvascular circulation, where it improves oxygen delivery and
works as an anti-inflammatory and antioxidant; the anthocyanosides also appear to assist in recovery of rhodopsin, a critical factor in night vision.

a. **Cataracts:** Because some cataracts have been attributed to damage by free radicals, there has been a great deal of interest in antioxidants, such as bioflavonoids, that protect against free radical damage to the lens.

   i. *In vitro data:* none
   
   ii. *Animal data:* none
   
   iii. *Human data:* In a case series of 50 elderly Italian patients with early stage cataracts, taking a combination of bilberry extract and vitamin E was associated with cessation of the progression of disease in 97%\(^3^7\). There are no controlled trials evaluating bilberry’s effects in preventing or treating cataracts.

b. **Diabetic retinopathy and macular degeneration:** Based on bilberry’s bioflavonoid content, some herbalists recommend it for patients with macular degeneration. Bilberry extracts are widely used in Europe to prevent and treat diabetic retinopathy\(^3^8\).

   i. *In vitro data:* none
   
   ii. *Animal data:* none
   
   iii. *Human data:* In an Italian study, 12 adult diabetics were treated with 600 milligrams of anthocyanosides daily for two months; before and after treatment, gingival samples were analyzed for connective tissue synthesis. Following treatment, there was a significant decrease in the biosynthesis of connective tissue. The authors interpreted these results to mean that anthocyanosides could protect diabetics from retinopathy\(^3^9\). In an Italian study of 30 subjects (ten normal adults, ten diabetics without retinopathy and ten diabetics with retinopathy), treatment with bilberry extracts improved macular recovery time in the normal subjects and in the diabetics without retinopathy\(^4^0\). In another case series of 31 patients suffering from various types of retinopathy, treatment with bilberry extract was associated with a reduced tendency toward retinal hemorrhage. One controlled trial reported positive results with bilberry treatment of diabetics with hypertensive retinopathy; these results were reported in abstract form in Italian\(^4^1\). There are no English language reports
evaluating the effectiveness of bilberry in treating diabetic retinopathy or macular degeneration.

c. **Impaired night vision**
   i.  *In vitro data:* none
   ii. *Animal data:* In rabbits, anthocyanoside treatment sped the regeneration of rhodopsin in the retina and improved their ability to adapt to darkness\(^1\).
   iii. *Human data:* In World War II, pilots from Britain’s Royal Air Force swore by the benefits of bilberry jam in improving their vision for night flights. In one study from the 1960’s, patients given a combination of bilberry (400 mg/day) and beta-carotene (20 mg/day) had improved night vision and adaptation to changes in light intensity\(^42\).
   In case series of airline pilots, truck drivers and air traffic controllers, daily use of standardized bilberry extracts improved night vision, quickened adjustment to changes in light intensity, and sped restoration of visual acuity following exposure to glaring light\(^16, 38, 43, 44\). However, there are no English language publications of controlled trials evaluating bilberry’s benefits in improving night vision.

6. **Endocrine:** *Diabetes.* Bilberry fruit and leaves have been used in several folk remedies as a treatment for diabetes in adults.
   i.  *In vitro data:* none
   ii. *Animal data:* Diabetic dogs and rats exhibited lower blood sugar levels when treated with bilberry leaves, even when given intravenous glucose concurrently\(^38\).
   iii. *Human data:* There are no controlled trials evaluating the effects of bilberry fruits or leaves on blood sugar levels or diabetic control in adults or children, nor any studies evaluating bilberry’s potential interaction with standard diabetic medications.

7. **Hematologic:** *Inhibition of platelet aggregation.* See Cardiovascular.

8. **Rheumatologic:** none

9. **Reproductive:** none

10. **Immune modulation:** none

11. **Antimicrobial:** Many of the anthocyanosides found in bilberry are closely related to the proanthocyanidins thought to be responsible for cranberry’s effects in impeding bacterial adhesion to bladder epithelium. Bilberry fruits and leaves have historically been used to treat a variety of infectious disorders.
i. *In vitro data:* In cell cultures, bilberry extracts inactivated tick-borne encephalitis virus, but bilberry had no impact on infection rates *in vivo*\(^45, 46\).

ii. *Animal data:* none

iii. *Human data:* There are no controlled trials specifically evaluating the antimicrobial effects of bilberry in adults or children.

12. **Antineoplastic:** Antineoplastic

i. *In vitro data:* Bilberry, like cranberry, lingonberry and low bush blueberry, exhibited potential anticarcinogenic activity during *in vitro* screening tests\(^47\).

ii. *Animal data:* none

iii. *Human data:* There are no controlled trials evaluating the antineoplastic effects of bilberry.

13. **Antioxidant:** Antioxidant

i. *In vitro data:* Bilberry has similar antioxidant effects as green tea, pine bark extract, grape seed extract, blueberries and ginkgo\(^13, 48\). The anthocyanoside fraction inhibited lipid peroxidation, scavenged superoxide anions, and removed hydroxyl radicals\(^49, 50\).

ii. *Animal data:* Like vitamin E, anthocyanins protected liver cells from oxidant damage induced by carbon tetrachloride in animal studies\(^51\).

iii. *Human data:* There are no human trials evaluating bilberry’s antioxidant effects.

14. **Skin and mucus membranes:** Vulnerary: Historically, bilberry has been recommended as a treatment for easy bruising, hemorrhoids, and skin lesions; however, these uses have not been evaluated in controlled trials.

i. *In vitro data:* none

ii. *Animal data:* none

iii. *Human data:* In a case series of 47 adults with a variety of circulatory problems (atherosclerosis, a tendency to bruise easily, hemorrhoids and varicose veins), bilberry extracts reportedly improved circulation and reduced symptoms such as edema, feelings of heaviness and pain, and skin dystrophy\(^16, 38\). There are no randomized, controlled trials evaluating bilberry’s effects as a wound-healing agent.

15. **Other/miscellaneous:** none
Toxicity and Contraindications
All herbal products carry the potential for contamination with other herbal products, pesticides, herbicides, heavy metals, and pharmaceuticals. This is particularly concerning for imports from developing countries.

Furthermore, allergic reactions can occur to any natural product in sensitive persons.

Allergic reactions have not been reported.

Potentially toxic compounds in bilberry: None

Acute toxicity: Very rare. Consuming very large amounts may cause stomach upset and increase clotting times6.

Chronic toxicity: None reported

Limitations during other illnesses or in patients with specific organ dysfunction: None reported, but based on bilberry’s effects on blood glucose and platelet adhesion in animals, caution should be used in patients with bleeding disorders, diabetes, or hypoglycemia.

Interactions with other herbs or pharmaceuticals: None reported, but based on bilberry’s effects in animals, caution should be used by patients taking anticoagulant or antihyperglycemic medications or herbs.

Safety during pregnancy, lactation and/or childhood: Presumed safe based on food use
**Typical Dosages**

Provision of dosage information does NOT constitute a recommendation or endorsement, but rather indicates the range of doses commonly used in herbal practice.

Doses are given for single herb use and must be adjusted when using herbs in combinations.

Doses may also vary according to the type and severity of the condition treated and individual patient conditions.

**Adult doses:** There is disagreement on the optimal form and dose of bilberry. Reputable physicians and herbalists recommend a range of doses:

*Standardized extract* (25% anthocyanosides): 80-160 mg BID–TID\(^1, 2, 6, 38\)

*Capsules:* 1,000 mg BID\(^4\)

*Dried berries:* 1–2 teaspoons, chewed twice daily\(^4\)

*Tea:* 5-10 grams of crushed berries in 1 cup water, boiled for ten minutes and strained.

May be drunk as tea or applied topically up to six times daily.

NOTE: Dried bilberries contain a higher tannin content and lower sugar content than fresh berries and are the preferred form for treating diarrhea and oral irritations.

**Pediatric dosages:** Unknown

**Availability of standardized preparations:** Yes; extracts should be standardized to contain 25% anthocyanosides.

**Dosages used in herbal combinations:** Variable

**Proprietary names:** Alcodin, Angiorex, Antocin, Difrarel, Herbal Eye Care Formula, Largitor, Mitrilene Forte, Myrtaven, Myrticol, Retinol, Tegens

**Multi-ingredient preparations containing bilberry:** Alfa Mirtillo, Alvear Sport, Amersan, Antomiopic, Bebimix, Diacure, Difrarel, Herbal PMS formula, Mirtilene, Mirtilus, Prophthal, Ultravisin, Vitalmix

**See Also:**


REFERENCES


