Black Cohosh (*Actaea racemosa* L.)

MARCH 2013

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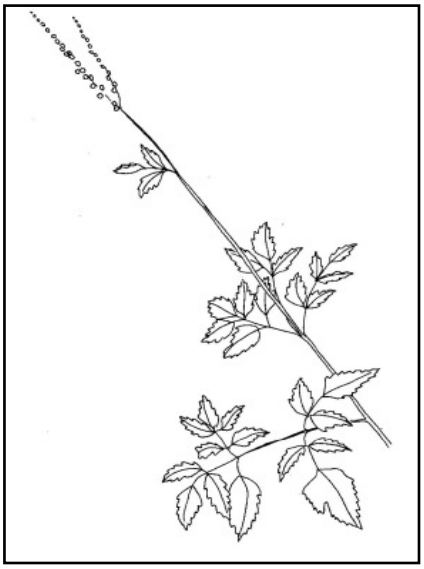
Introduction

Botanical Information

Black cohosh [formerly Cimicifuga racemosa (L.) Nutt] is a member of the Ranunculaceae family. It is a native medicinal plant found in rich hardwood forests from as far north as Maine and Ontario, south to Georgia, and west to Missouri and Indiana. In North Carolina, it can be found at elevations up to 4,000 feet and is most common in the western part of the state. The leaves are large with three pinnately compound divisions and irregularly toothed leaflets. Tall florets of white flowers, on wand-like flower stalks, bloom from May to July, often towering over 6 feet tall. From August to October, seeds develop in capsules that make a rattling sound when shaken. At this stage, the seeds are mature and ready to be harvested.

The black cohosh rhizomes and roots are economically valuable. The rhizome is dark-brown to black in color, is thick and knobby, and produces large buds on the upper surface. The rhizomes are covered with fibrous roots, which are usually concentrated on the bottom portion of the rhizome. Throughout the rest of this article, "root" refers to the rhizome and roots, unless stated otherwise. The root is most commonly harvested when the leaves on the plant start to die back in the fall.



Bioactive Components

The main bioactive components of black cohosh appear to be the triterpene glycosides, including actein and 27-deoxyactein (also known as 23-epi-26-deoxyactein); phenylpropanoid derivatives, the majority of which are caffeic acid derivatives; and flavonoids. Other compounds found in the root include aromatic acids, tannins, resins, and fatty acids.

Uses and Treatments

Native Americans used black cohosh for a variety of medical conditions ranging from gynecological problems to snake bites. Physicians made use of it in the 19th century to treat fever, menstrual cramps, and arthritis. In Europe, black cohosh has been used for over 50 years as a treatment for menstrual pain. Other traditional and folk uses are for treatment of sore throats and bronchitis. Currently, the primary use of this product is as an alternative to hormone replacement therapy (HRT) for treatment of menopause and premenstrual syndrome. Black cohosh has been clinically proven to create an "estrogen-like" effect in the user, often reducing unpleasant menopausal symptoms, such as hot flashes and night sweats.

Black cohosh rhizomes from Dr. Jeanine Davis' Program. The arrow points to the buds. When preparing rhizomes for propogating, divide into 2 to 3 inch sections with at least one bud attached to each piece.

Cultivation Practices

Site Selection

Black cohosh prefers a rich, moist soil high in organic matter. In its natural habitat, it is usually found in shaded or partially shaded areas, although it will grow in full sun. Black cohosh can be grown successfully in raised beds in the woods (referred to as "woods cultivated"), in raised beds under an artificial shade structure (referred to as "shade grown"), or in a low-density, low-input method mimicking how it grows in the wild (referred to as "wild simulated").

Regardless of the cultivation system used, it is important to choose a site with well-drained but moist soil. Black cohosh has been known to tolerate more light and soil variations than ginseng or goldenseal, provided adequate moisture is available. Raised beds are recommended, especially for clay soils or areas that tend to stay wet after a heavy rain. Make sure sufficient compost or other organic material is added to raise the organic matter content of the soil. Soils with pH of 5 to 6 are ideal for growing black cohosh.

Black Cohosh growing under an experimental shade structure at NCSU's Mountain Horticultural Crops Research & Extension Center: Dr. Jeanine Davis' Program

For woods cultivated or wild simulated production, select a site shaded by tall hardwood trees. Look for a site where other woodland plants grow such as mayapple, trillium, bloodroot, ginseng, or a native stand of black cohosh. If woods are not available, an artificial shade structure can be constructed. Typically, wood lath or polypropylene shade cloth providing 30 to 85 percent shade is used. Build the structure 7 feet tall or higher with two opposite ends open to the prevailing breeze. Black cohosh will grow in an open field in full sun, although the effect on plant growth, root quality, and chemical constituents is not fully understood.

Planting

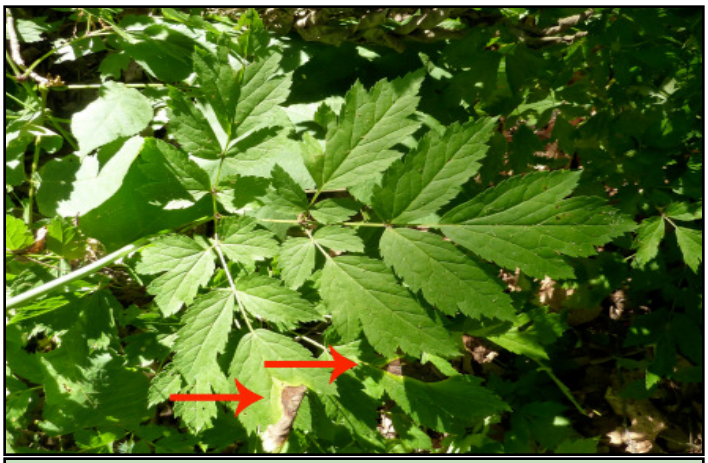
Black cohosh is most easily propagated by dividing the rhizomes in spring or fall. Plants can also be started indoors from seed or seed can be directly sown into the ground, but rhizome divisions provide a more uniform plant stand and reduce the time from planting to root harvest. On a practical note, large quantities of seed were not readily available when this article was written.

To propagate by rhizome divisions, cut rhizomes into sections, 2 to 3 inches in length, making sure at least one bud is attached to each piece. Up to 15 buds can be on the rhizome of one black cohosh plant. Fibrous roots connected to the rhizome pieces should remain attached. In a well-prepared bed, 3 to 5 feet wide, plant the rhizome pieces deep enough to cover the top of the rhizome with 2 inches of soil. Stagger plantings 18 to 24 inches apart, making sure the bud is pointed upright when placing the rhizome pieces in the ground. Cover beds with at least 3 inches of shredded hardwood bark mulch or leaf mulch. Add mulch as needed throughout the life of the planting to retain soil moisture and retard weed growth. Roots should be ready to harvest three to five years after planting.

Black cohosh seeds must be exposed to a warm/cold/warm cycle before they will germinate. The easiest way to grow plants from seed is to harvest the mature seed in the fall and then sow in the ground immediately, allowing nature to provide the necessary temperature changes. To do this, collect the seed when the capsules have dried and started to split open and the seed "rattle" inside. Plant them 1½ to 2 inches apart, approximately ½-inch deep in shaded, prepared seed beds. Cover with a 1-inch layer of hardwood bark or leaf mulch and keep moist. Some germination may occur the following spring, but most seeds will not emerge until the second spring. To speed up and improve germination, herb grower Richo Cech suggests exposing the seeds to warm temperature (70°F) for two weeks, followed by cold temperature (40°F) for three months.

Bee pollinating Black Cohosh -Dr. Jeanine Davis' Program

If you purchase seed, ask how the seeds have been handled, whether they have been stratified (exposed to warm and cold temperatures) and for how long, and what the anticipated germination rate is. Purchased seed often has a much lower germination rate than seed that you collect yourself and sow immediately. Purchased seed frequently takes two years to germinate after sowing. Transplant seedlings into regular planting beds when a second set of true leaves emerges. Roots should be ready to harvest four to six years after seeding.



Black cohosh leaf spots are caused by Ramularia actaea, Ascohyta actaea, and Ectostroma applaturn. Consult a Pathology Handbook to properly identify the disease and apply necessary fungicide. Photo credit: Springfield Plateau Chapter of the Missouri Master Naturalist

Insects and Diseases

Common diseases found on black cohosh consist of several leaf spots and root rots, including rhizoctonia. Rhizoctonia solani can cause damping off of young, emerging black cohosh seedlings. Control of rhizoctonia may be achieved by planting in well-drained soils and by not planting black cohosh in the same place you grew it before. Leaf spots can cause premature defoliation of the plant, reducing root growth and seed set. To prevent leaf spots, avoid planting in areas with poor air circulation and do not crowd plants. Once the disease is identified, collect and destroy all foliage with the disease symptoms. If more than a few plants are infected, and a positive identification of the disease has been made, an organic fungicide may be applied. No studies on the control of leaf spots on black cohosh have been published, but the Organic Materials Review Institute (www.omri.org/) can be consulted for organic fungicides that can be tried.

Common insects that attack black cohosh include cutworms and blister beetles. Consult the Organic Materials Review Institute (www.omri.org/) for

approved organic insecticides that can be tried. Other pests that forage on black cohosh include deer, opossum, rabbits, slugs, and snails. Fencing and repellents may be effective in deterring these pests.

Harvesting, Cleaning, and Drying

Most black cohosh is harvested in the fall before the plant dies back. At this time, the roots are at their peak in weight and bioactive constituents. A few buyers will also purchase fresh black cohosh roots in the spring.

Inside of an herb dryer, constructed for the Medicinal Herbs for Commerce Project by Dr. Jeanine Davis'

The entire root, including rhizome and fibrous roots, is harvested. Digging is usually done by hand using a spading fork.

Shake the harvested roots free of soil and carefully separate out any roots that are not black cohosh. All soil, sand, rocks, and other foreign matter must be removed. Protect the freshly harvested roots from the sun and heat and do not allow them to dry out. If the roots are to be used as planting stock, they should be planted immediately or mixed with moist sphagnum moss and stored in mesh bags, burlap bags, or cardboard boxes in a cooler at about 40°F. Check often to make sure that the roots do not dry out, and stir the roots frequently to aerate and prevent mold and mildew. If the roots will be sold for processing into an herbal product, wash them carefully with a pressure water hose or a root washer. A common root washer consists of a rotating drum with water nozzles positioned to spray the roots as they tumble, thoroughly cleaning them.

It cannot be stressed enough how important it is to remove all soil and sand from the roots. This can be challenging because of the knotty nature of black cohosh roots. Some roots will need to be cut to get them clean, but dirty roots will bring a low price or be rejected by the buyer.

To ensure the safety of your herbs for human consumption, follow the recommended Good Agricultural Practices shown at the website for the American Herbal Products Association (www.ahpa.org/) and be sure that your material will meet the federally mandated Good Manufacturing Practices shown at the website for the U.S. Food and Drug Administration (www.fda.gov/Food/DietarySupplementsGuidanceComplianceRegulatoryInformation/RegulationsLaws/).

If a dried product is desired, once the roots are clean, dry them at low heat with high airflow. If a special herb dryer is not available, a food dehydrator, a bulk tobacco barn, or a small room outfitted with racks, a heater, dehumidifier, and a fan can be used. There are several different temperature regimes for drying black cohosh, but the simplest one is to dry them at 80°F to 95°F (if the outside air is very humid, the temperature may have to be increased) for several days to a week. Once the roots are completely dry, store in burlap bags, polysacks, or cardboard drums in a cool, dark, and dry location. Keep no longer than one year. The dry-down rate for black cohosh is approximately one-third of its fresh weight. Potential yield per acre of the dried roots ranges from 750 to 2,500 pounds.

Marketing and Economics

Annual Consumption and Dollar Value

Black cohosh continues to experience a significant increase in demand, which has been satisfied by additional wild-harvest material coming to market.

Black Cohosh flowers. Photo Credit: Jane Shotaku

In 2000 around 118,000 pounds of dried *A.racemosa* was sold on the international market. In 2003, there was a peak in consumption at 320,000 pounds valued at almost $2 million. Strong interest in alternative herbal therapies for women's health issues may have led to this peak of consumption with more companies using black

cohosh in supplements supporting women's health. In 2005, the American Herbal Products Association (AHPA) reported that almost 154,000 pounds, valued at approximately $918,000, of fresh and dry material were sold on the market, with 95% being from wild-harvested sources. There was a sharp increase in consumption the following year, with over 300,000 pounds of *A.racemosa* on the international market, followed by a slight increase of consumer consumption to 360,000 in 2007.

Harvest volume decreased again in 2008 and 2009, most likely do to over-supply of *A.racemosa*, with 291,000 pounds and 170,000 pounds being consumed respectively. From 2007 through 2009, 99% of the supply on the world market was from wild-harvested sources. 2010 saw a rebound in volume, with 327,000 pounds being traded, with 96% being from wild-harvested sources. From 2000 to 2010, 2.7 million dry pounds of *A.racemosa* entered the world market. This equates to between 40.4 million to 54 million *A.racemosa* plants harvested for the medicinal herb trade over 10 years.

A variety of Black Cohosh products. Photo credt: Dr. Jeanine Davis' Program

Supply and Demand

Most of the supplies of black cohosh come from harvesting of native populations. Wild populations are becoming unstable and many of the large, easily harvested populations have already been exhausted. Although prices have risen recently, a strong response among growers to cultivate this material has not been triggered, and only small quantities of cultivated material make it to market. Accelerating demand in the face of uncertain supplies may lead to major imbalances that can only be alleviated in the short run by substantially higher prices.

Black cohosh buyers are located throughout the natural range of the plant but are most prevalent in the southeastern United States because that is where the largest concentration of wild populations exists. Cultivation efforts are currently under way in the United States and Europe, but only about 5 percent of the 2005 harvest was generated from cultivated sources. Buyers of black cohosh are searching for reliable supplies and emphasize the need for wild-simulated black cohosh.

The demand for black cohosh from all major wholesale buyers for the 2010 growing season was high. Of 15 major medicinal herb buyers contacted, 80 percent named black cohosh as one of the top three herbs most difficult to find at this time. This could be a significant opportunity for forest farmers wanting to participate in the industry. Prices for organic cultivated black cohosh are about 60 percent higher than that of wild-harvested. As the supply of black cohosh continues to diminish, prices are expected to steadily rise.

With growing health concerns over HRT treatments on the market, many health professionals are looking to black cohosh and other natural substances as potential treatment options for hormone depletion. Positive clinical results for black cohosh as an alternative for HRT continue to drive demand for this material. Demand for cultivated product will continue to increase as natural populations decline and become more widely dispersed. Just a few decades ago, the majority of the black cohosh that was harvested was sent to Europe for processing and consumption. While the majority is still sent to Europe, in the past 10 years, interest from North American companies for this botanical has increased dramatically.

Pricing

In 2012, growers and wild-harvesters of black cohosh were receiving an average of $5 to $7 per dry pound. Wholesale prices of dried, cut, and sieved black cohosh root averaged around $15 per pound, while retail prices are around $32. It should be noted that one large retail company was selling cultivated organic black cohosh for $44 per pound, while their wild-crafted black cohosh was being sold at a much lower price of $27 per pound. This could be a sign that the industry is placing more value on cultivated sources as wild-harvested sources continue to be depleted at a steady rate.

High levels of triterpene glycosides in the range of 2 percent, as well as isoflavones, are the primary

customer requirements for this material. An increasing number of buyers are requiring organic certification for this botanical.

Distribution Channels

Renewed interest in this material by pharmaceutical companies, in addition to scarce supply of raw material, has led to larger companies wanting to contract directly with wild-harvest suppliers. Interest in cultivation, particularly organically certified cultivation, also has increased although there is no evidence to suggest that organic cultivation is occurring on a large scale. The largest buyers are actively pursuing integrated cultivation options, but players of every size exist in the business. Higher root prices will continue to keep small collectors foraging for natural populations.

Black cohosh also is gaining popularity among shade gardeners, nursery container growers, and landscapers. Selections of native species are available as well as varieties with purplish leaves and stems. As a background plant in a shade garden, the gracefulness of this plant in flower will hardly go unnoticed. In 2012, nursery containers range in price from $3.95 to $10.00 per plant.

Commercial Visibility

Black cohosh continues to be one of the fastest-growing herbal products. Of the leading nutraceutical/botanical companies in the United States and Europe, 46 percent offer black cohosh as a standalone product, and 65 percent offer this material as either a standalone product or as part of a multi-constituent supplement.

Conclusion

Private forest landowners throughout the plant's natural range have the potential to become major producers of forest-farmed black cohosh. Native populations of black cohosh can still be found, but they are diminishing, making this an attractive prospect for forest farming. Now more than ever, there is great concern over the plant's sustainability as many black cohosh sites have dramatically decreased in size. Many stakeholders in this industry—from buyers to botanists—are stressing the importance of forest farming of this and other non-timber forest products.

Commercial interest in this material has never been greater. Naturally occurring populations will not satisfy the expected increase in demand of 30 to 40 percent annually over the next three to five years. Lack of significant cultivation creates an opportunity for private forest landowners to fill the gap in supply as wild populations continue to decline.
This material has never traded in a very high price range for a sustained period of time, but its current price is starting to move upward. Significant quantities of this product are already trading on world markets. It is expected that cultivated material will become more prevalent in the supply chain as prices continue to increase 10 to 20 percent annually over the same period. Overall supply will slowly increase but not at a rate commensurate to growth in demand. This factor should keep prices moving upward with moderate momentum.

Resources

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This article is a revision of two manuscripts. One was published in 2004 for the North Carolina Consortium on Natural Medicines, a Golden LEAF Foundation-funded project of the University of North Carolina-Chapel Hill and North Carolina State University. The original article was authored by Jackie Greenfield and Jeanine Davis and can be found at www.ncmedicinalsofnc.org. The second manuscript was a revision of the first one and was published in 2006 as a Horticulture Information Leaflet with North Carolina State University. It can be found at www.ces.ncsu.edu/depts/hort/hil/pdf/hil-135.pdf. It was authored by Jackie Greenfield, Jeanine Davis, and Kari Brayman.

A special thanks to the American Herbal Products Association's contribution to this leaflet with their continued consultations and their invaluable annual Herbal Tonnage Reports.

Development of the latest version of this leaflet was funded by a grant from the Golden LEAF Foundation and administered by Advantage West. The project is the WNC Natural Products Project and includes the following partners: AdvantageWest, Bent Creek Germplasm Repository, Bionetwork Biobusiness Center, Blue Ridge Food Ventures, North Carolina State University, and Western Carolina University.