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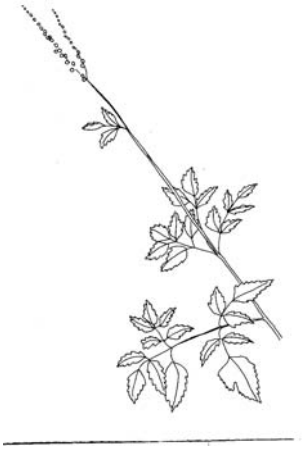
Black Cohosh (*Actaea racemosa* L.)



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Introduction

Botanical Information

Black cohosh [*Actaea racemosa* (L.) formerly *Cimicifuga racemosa* (L.) Nutt] is a member of the Ranunculaceae family. It is a native medicinal plant found in rich woodlands 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 ft and is most common in the western part of the state. It is an herbaceous perennial reaching a mature height of over four ft tall and can grow 18 to 22 inches per month during the growing season. The leaves are large with three pinnately compound divisions and irregularly toothed leaflets. Tall plumes of cream to white flowers, on wand-like flower stalks, bloom from May to July, often towering over six ft. 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 of economic importance. 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 publication, "root" refers to the rhizome and roots unless stated otherwise. When the leaves on the plant start to die back in the fall, the root is harvested, cleaned, and usually dried.

Bioactive Components

The main bioactive components of black cohosh are the triterpene glycosides, acetein and 27-deoxyactein, and the isoflavone, formononetin. 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 40 years as a treatment for menstrual pain. Other traditional and folk uses were for treatment of sore throats and bronchitis. In recent years, this material has been used as an alternative to mainstream hormone replacement therapy 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.

Cultivation Practices

Site Selection

Black cohosh prefers a rich, moist, soil that is 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 there is adequate moisture available. Raised beds are highly 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.

For woods cultivated or wild simulated production, select a site shaded by tall, hardwood trees or a mix of hardwood and pine 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 32% to 85% shade is used. Build the structure seven ft tall or higher with two opposite ends open to the prevailing breeze. Black cohosh will grow in an open field in full-sun. 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 allow for a faster harvestable root. Plus, large quantities of seed are not readily available at this time.

Black Cohosh Rootstock

To propagate by rhizome divisions, cut rhizomes into vertical sections, two to three inches in length, making sure there is at least one bud attached to each piece. There can be up to 15 buds on the rhizome of one black cohosh plant. Any fibrous roots connected to the rhizome pieces should remain attached. In a well-prepared bed, three to five ft wide, plant the rhizome pieces deep enough to cover the top of the rhizome with two inches of soil (usually means digging a four to six inch deep hole or trench). 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 three 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 1 ½ to 2 inches apart, approximately ¼ inch deep in shaded, prepared seedbeds. Cover with a one-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 the germination process and improve the germination rate, herb grower Richo Cech suggests exposing the seeds to warm temperature (70^{o}F) for two weeks, followed by cold temperature (40^{o}F) for three months.

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 over 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.

Insects and Diseases

Common diseases found on black cohosh consist of several leaf spots and root rots, including Rhizoctonia. 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 control of leaf spots on black cohosh have been published, but the Organic Materials Review Institute (http://www.omri.org/) can be consulted for organic fungicides that can be tried.

Rhizoctonia solani caused damping-off in young emerging black cohosh seedlings in a study done in Canada. 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.

Common insects that attack black cohosh include cutworms and blister beetles. Consult the Organic Materials Review Institute (http://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, primarily because that is when the roots are at their peak in weight and bioactive constituents. There are some buyers who will also purchase it in the spring. 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 from the sun and heat and do not allow the roots 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^{o}F. Check often to ensure 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, 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

Inside of an herb dryer, constructed for the Medicinal Herbs for Commerce Project

(http://www.ahpa.org/Default.aspx?tabid=69&aId=333) and be sure that your material will meet the federally mandated Good Manufacturing Practices (http://www.fda.gov/Food/DietarySupplementsGuidanceComplianceRegulatoryInformation/RegulationsLaws/ucm110858.htm).

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° to 95°F 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 lbs per acre.

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. The five year consumption high was maintained in 2003 at 320,000 pounds, and fell back to 1999-2000 levels in 2005 with 153,000 pounds consumed. Industry experts believe that the harvest decline in 2005 was not due to demand factors, but a cause of excess supplies of black cohosh being maintained from the 2003 harvest levels. About 80% of this cohosh was wild-collected.

The strong interest in alternative herbal therapies for women's health issues may have led to this peak of consumption beginning in 2003, with more companies using black cohosh in supplements supporting women's health. Industry analysts believe that the tonnage decrease from 2004 to 2005 may be due to the build-up of supply in 2003 when demand and price were the highest for black cohosh.

The total dollar value of consumption peaked in 2003 at almost $2 million. In 2005 the value of consumption was $918,000.

Supply and Demand

Supplies of black cohosh come mostly from the harvesting of native populations. Although prices have risen recently, a strong response among growers to cultivate this material has not been triggered and only small relatively quantities of cultivated material make it to market. Wild populations are becoming unstable and many of the large, easily harvested wild populations have already been exhausted. 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 (suppliers) 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 large wild populations exists. Cultivation efforts are currently underway in the United States and Europe, but only about 5% 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, 80% named black cohosh as one of the top three herbs that is most difficult to find at this time. This could be a significant opportunity for growers wanting to participate in the industry. Prices for organic cultivated black cohosh are about 60% 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 Hormone Replacement Therapy (HRT) treatments currently 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 to be used as an alternative for HRT continue to drive demand for this material. Demand for cultivated product will continue to increase as naturally occurring populations become fewer in number and more widely dispersed. Just a few decades ago, the vast 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

Growers and wild-harvesters of black cohosh are receiving an average of $5 – $7 per dry pound. Wholesale prices of dried, cut, and sifted black cohosh root average around $15 per pound, while retail prices are around $32. It should be noted that one large retail company is selling cultivated organic black cohosh for $44 per pound, while their wild-crafted black cohosh is being sold at a much lower price bracket 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% and 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 desiring to contract directly with wild-harvest suppliers. Interest in cultivation, particularly organically certified cultivation, has also increased though there is no evidence to suggest that organic cultivation is occurring on a large scale. The largest players 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 is also 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. Nursery containers range in price from $3.95 to $10.00 per plant.

Commercial Visibility

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

Conclusion

North Carolina has the potential to become a major producer of cultivated black cohosh, especially in the western regions of the state. Native populations of black cohosh can still be found in many western counties, but they are diminishing. Now more than ever, there is great concern over the plant's sustainability as many black cohosh sites have dramatically decreased in size. Many players in this industry – from buyers to botanists – are stressing the importance of cultivation in North Carolina.

A variety of black cohosh products

Commercial interest in this material has never been greater. Naturally occurring populations will not satisfy the expected increase in demand of 30-40% annually over the next three-to-five years. Lack of significant cultivation creates an opportunity for North Carolina growers 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 10-20% annually over the same period. Overall supply will slowly increase but not at a rate commensurate to demand growth. This factor should keep prices moving upward with moderate momentum.

Cech, R.. 2002. Growing At-Risk Medicinal Herbs. Horizon Herbs. Williams, OR.

Resources

Davis, J.M. and J. Greenfield, (eds.) 2003. Analysis of the economic viability of cultivating selected botanicals in North Carolina. A report commissioned from Strategic Reports for the North Carolina Consortium on Natural Medicinal Products by North Carolina State University, Raleigh, NC.

Persons, W.S. and J.M. Davis. 2005. Growing and Marketing Ginseng, Goldenseal, and Other Woodland Medicinals. Bright Mountain Books, Fairview, NC.

Reeleder, R.D. 2003. The ginseng root pathogens *Cylindrocarpon destructans* and *Phytophthora cactorum* are not pathogenic to the medicinal herbs *Hydrastis canadensis* and *Actaea racemosa*. Canadian Journal of Plant Pathology 25(2):218-221.

Sturdivant, L., T. Blakley. 1999. Medicinal Herbs in the Garden, Field, and Marketplace. San Juan Naturals, Friday Harbor, WA.

US Department of Agriculture, Crops Research Division Agricultural Research Service. 1960. Index of Plant Diseases in the United States, Agriculture Handbook No. 165. Washington, DC.

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

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