

## MINI REVIEW

# Fireweed – a treasured medicine of the boreal forest

Robert Dale Rogers\*



### ABSTRACT

A large segment of the Canadian population (approximately 71%) take natural health products, the Baseline Natural Health Products Survey among Consumers, suggesting this trend is likely to continue, with increasing awareness of side effects associated with pharmaceutical prescriptions and over the counter medications. Fireweed (*Chamerion angustifolium*) is an often-overlooked herb with amazing medicinal properties. Traditional First Nations usage and modern pharmacology as well as clinical studies suggest its beneficial effects in a number of health concerns. Fireweed has been known to possess anti-inflammatory effects in addition to the recent evidence on its therapeutic effects for both benign prostatic hyperplasia (BPH), and prevention of prostate cancers. This mini review provides some additional information obtained from First Nations healers, the empirical knowledge associated with clinical practice and aims to stimulate additional interest in the genus, and especially in the circumpolar species of *Chamerion angustifolium*.

**Keywords:** *Chamerion angustifolium*, anti-inflammatory, benign prostatic hyperplasia

### Introduction

Fireweed is a healer of burns, including mother earth. Whenever forest fires have devastated, the beautiful magenta blooms begin the healing process, and prepare the soil for willow and poplar to follow. Fireweed is indifferent to soil pH, and is adaptable to both acidic and alkaline soils. Epilobium is from Epi meaning upon, and Lobium pod, lobon, or capsule. It refers to new flowers being superior or on top of the seedpods. Boisduvalia is named in honor of Jean Alphones Boisduval, a 19th century French naturalist and author of a floral book of France. Chamerion is from the Greek Chamae or Khamai meaning lowly or on the ground and Erion for wool and angustifolium means narrow-leaved. Fireweed is perhaps derived from the German Feuerkraut, the name given by Gesner in 1561, for a plant that flourishes on ground cleared by fire. In England, the common name Bombweed was given for the quick manner of its colonization of bombsites.

The fireweed starts flowering from the bottom up, each blossom lasting only two days. On the first, it produces sticky turquoise colored pollen, and on the second no pollen, but is receptive to fertilization and gives off a strong fragrance from its nectar. Older blossoms contain more nectar, giving bees a drink first, before they climb up to scrape pollen out of the younger flowers.

The stickiness of the turquoise pollen is due to a lipid coating, pollenkitt, and viscin threads. This

helps ensure cross-pollination, with each plant capable of producing up to 45,000 seeds.

### First Nations ethnobotany

The Cree call it Ihkapaskwa, and noted it flowered when the moose were fattening and mating. Other names include Askapask, Athkapask, and Akapuskwah. The root was macerated and applied to boils or infections. The leaves were plastered on bruises. The raw roots were a popular native food source. Even the summer stem was split open with the thumbnail or between the teeth, to extract the inner edible "pith". It tastes a bit like cucumber but is very sweet and can give a sugar buzz when needed. The Kamtschadalis of eastern Russia boiled the plant with fish and used the leaves as tea. The pith was scraped out with shells, tied in bundles and sun-dried known as Kipri, it was boiled into thick, sweet wort and used to make Quaffe, a fermented drink of malted rye, flour and wild mint. Six pounds of Kipri was mixed with one pound of cow parsnip stalks and fermented for vinegar.

The Woods Cree of Saskatchewan made a tea of the whole plant for intestinal parasites. The root can be crushed and applied to boils or abscesses, or to draw out infection from open wounds.<sup>1</sup> The root is used by the Cree of Wabasca as part of a decoction to reveal whether or not a woman is pregnant.<sup>2</sup>

Russell Willier, a northern Alberta Cree medicine man uses the roots to purify blood. He calls it Eskohtiyowaskwa or Skohtiyociyipihk. The

\*Corresponding author, E-mail: [scents@telusplanet.net](mailto:scents@telusplanet.net). Assistant Clinical Professor, Department of Family Medicine, Faculty of Medicine & Dentistry, University of Alberta, Edmonton, Canada. Copyright: © 2014 Robert Rogers. This is an open-access article distributed under the terms of the Creative Commons Attribution License.

Blackfoot rubbed fireweed flowers on their mittens and rawhide thongs as waterproofing. The inner pith from the stems was dried, powdered and rubbed on the hands and face as protective talc from winter's icy grip.

The Ojibwa call it Zhoshkidjeebik or Oja'cid'bik meaning slippery root, or soap root. They would moisten and pound the root until it lathered up and applied it as a poultice to bruises, boils, furuncles and sores. An alternate name is Keg'i'nano'kuk meaning sharp pointed weed. The northern Chipewyan call fireweed, Gon Dhi'ele meaning Fire New Branch. Natives of Nunavut ate the tops of Paunnait as summer food. The young stems are full of sweet water and can be sucked out. Sophie Thomas, a Sai'Kuz elder and herbalist, suggests drying the root and then cooking it to treat asthma.<sup>1</sup>



Fig. 1 Fireweed - *Chamerion angustifolium*

Many native groups including the Gitksan used this syrup as a type of glue to keep their berry rolls stuck together. When not available, they would use bunchberries as glue. It is called Haast. The K'ilhasst or single fireweed was the first totem pole, and Gisk'aast is the name of one of the four Pdeek or Clans of the Gitksan. One totem pole of Kitsequacia shows the flower as a crest, and fireweed was used as the name of a clan or society within the tribe.

The fireweed was first chewed and crushed to remove all the sour juice. The ground fireweed was often mixed with seal blood and then oil to make Aluk.

Various tribes rubbed the fresh leaves on bowstrings to help preserve them. The Thompson from B.C. used the small twisted roots as good luck charms. The Haida peeled the young shoots and ate them to purify their blood, make them handsome or to move stuff around one's insides, referring to a tonic and laxative effect.

The shoots are split with the thumbnail and then the tender inside is scraped out with the bottom teeth. The Dena'ina of Alaska place the raw stem on cuts or boils to draw the pus and prevent infection. A decoction of the aerial parts was used in parts of Alaska and throughout the Arctic to initiate breast milk secretion. Newcombe<sup>3</sup> noted that cordage is made from the stem fibers. From the fibrous skin or bark after the outer layer had been got rid of by prolonged immersion in water, a string used to be spun, which was afterwards made into nets.

The roots were used medicinally by the Haida in an unspecified manner. According to Swanston<sup>4</sup>, a game called Woman's Pubic Bones, used fireweed stalks as an item of wager. The Inuit have been reported to eat the roots, after boiling. Further south, the Algonquin grated the fresh root as a poultice to eliminate furuncles. The fluff from ripened pods is used as tinder to start fires; and when carbonized is extremely susceptible to the smallest spark or heat friction. Wick up refers to the use of rolled fluff as a wilderness candlewick inserted in tallow or other fat.

Its insulating factor has been utilized by many people, including the natives of Puget Sound, who wove the fiber into mountain goat hair to make waterproof blankets. Other tribes used duck feather cattail/fireweed combinations. Down feathers and fireweed fluff make excellent comforters. It also makes an excellent wilderness bandage combined with balsam pitch; and the best of wilderness candle wicks. In an experiment by Salisbury, fireweed fluff was dropped ten feet in a draught-free room. It took the better part of a minute to sail to the floor, explaining its wide dispersion in nature. The outer stem fibers are very tough and can be twisted into snare cordage, usable but inferior to dogbane. It should be peeled off the stem and dried in June or July, before the plant flowers, and stems become too hard. Later, the dried strips are soaked in water and twisted or spun into twine for nets, or to make pack straps. Six or more strands require braiding to possess any great strength.

The Cheyenne of Montana call it red medicine. A tea from the root and leaves was taken to cure for rectal hemorrhage. Hall's Willow Herb is rare, but it has been found the plant around Lesser Slave Lake. The flower is white, often fading to pink, with

distinct fireweed leaves, and found on moist ground, or in the wet boreal forest.

River Beauty (*E. latifolium*) inner stems were a choice edible of the Bella Coola people. The Inuit of Baffin Island call it Broad-leaved Willow Herb, Dwarf Fireweed or Paunnat. The leaves are eaten raw or mixed with fat, while the flowers are mixed with crowberries, blood and oil. In Greenland, the plant is known as Novaqsiq meaning little girl, and is designated the national flower.

*Epilobium glandulosum* was used by the Hopi as an analgesic for leg pain. The Navaho-Kayenta used plant infusions as a lotion and the roots as a poultice for muscular cramps. The Potawatomi tribe used root infusions to help stop diarrhea.<sup>2</sup>

### Global uses

Early French settlers called the young shoots Asperge and steamed them as an early green. The unopened buds can be added to salads, or pickled like capers for winter. Fireweed was introduced back to Europe, where today it remains a popular vegetable. Fireweed contains 90 times the Vitamin A and 4 times the Vitamin C of oranges. In Greenland, the leaves are combined with seal blubber for a spicy treat. Research in Sweden found the roots are an acceptable survival food if soaked in ash water for several hours. The natives of Kamchatka made stupifying ale from fireweed. They combined fireweed pith, cow's parsnip stems, unripe bog blueberries and dried amanita mushroom in a fermented drink.

Dried fireweed leaf tea is relaxing and calmative, reminiscent of green tea, but caffeine free. An oven roasted leaf tea from Russia is called Kurilski Chai, Kapoorie or Kurile Tea. The fresh leaf tea is sour and not particularly pleasant. In Siberia, the leaves are first fermented and used for tea. It is called John's Tea, or Ivanchai. The roots may be roasted and prepared as a coffee substitute.

Fireweed honey is already an important commercial bee product, with a distinctive buttery, caramel taste. Sugar yields from individual flowers range from 0.66 mg per flower per day to over 4.0; with yields increasing with temperature up to 24°C, and decreasing thereafter. Flower life is 5-6 days at 14°C. Fireweed is the floral emblem of the Yukon. White flowered variations are probably the result of mutation from radiation near uranium deposits, and in the wild may well help geologists find these sources. When additional nitrogen is made available to the plant, a noted increase in asparagine and glutamine is found.

Pygmy Fireweed is found on mud flats, especially alkaline clays on the prairies. Its small flowers are similar to those of River beauty, but the leaves are lance shaped with small teeth. Marsh Fireweed, according to Dr. Millspaugh, is a mild tonic and astringent, quite useful in slight types of diarrhea and dysentery attended with colic, cramps in the stomach, and light typhoid abdominal symptoms. The seed hairs are applied as a styptic in Traditional Chinese Medicine, where the plant is one of several species known as Liu Ye Cai.

Linnaeus, the father of plant classification, was inspired to make a list of edible flora, due to the famine of 1756. He listed 12 dialect names for *E. angustifolium* including, Weasel Milk, Heaven Grass, Elk Food, Calf Ass, Milk Ass, and Fox Ass. The related *E. brevifolium* is made into a paste in Nepal, and applied to muscular pain. The related *E. hirsutum* is known as Codlins and Cream in England, as the plant has the refreshing scent of ripe apples. Breeders have crossed this species with our native *E. luteum* and created a purple black flowered plant with apple perfume.

### Myths and legends

One legend of the fireweed tells of an Indian maiden. To rescue her lover from an enemy tribe which was preparing to torture him, she set fire to the forest about their camp. While they fled before the flames, she lifted the wounded man and carried him off through the woods. Some of the tribe, unfortunately, saw what she was doing and followed her. With her heavy burden she could not travel fast enough to escape but wherever she touched her moccasined feet to the black ashes of the forest floor a flame sprang up in her wake and drove the enemy backward. When at last they gave up the chase, flames continued to leap about her but they took the form of a brilliant flower that blazed through the blackened skeleton of the forest long after she had passed.<sup>5</sup>

The First Woman of the Tlinget people, Asintmah initially appeared near the Athabasca River in northern Saskatchewan, Canada. As Earth Mother, she walked over the land, collecting fallen branches to make her loom.

Asintmah wove a blanket from the fibers of fireweed, the willow herb loved by Earth. Then she gathered the sacred cover and walked in all four directions, spreading it over Earth's body. Finally, Asintmah wove threads of music and sang as Earth heaved and birthed her children, bringing Mouse, Rabbit, Cougar, Caribou and all the other animals onto the land.<sup>6</sup>

## Medicinal potential

*C. angustifolium* contains mucilage, tannins (up to 20%), chaermericm olenolic and maslinic acids; ursolic and 2-hydroxyursolic acids; sugars, starches, pectin, Vit C, calcium salts, beta-sitosterol caproate, sitosterol glucoside and sitosterol<sup>6</sup>-acetylglucoside; various sitosterol esters including propionate, caproate, caprylate, caprate, palmitate; and flavonoids including myricetin 3-O-β-D-glucuronide; quercetin (0.42%), myricetin (0.32%), kaempferol (0.37%), sexangularetin, and various sterol acetates such as beta sitosterol (66.8%) kaempferol (1.2%), and stigmasterol (0.4%). Total sterol content is 0.1221g/ 100 grams. Various acids such as ferulic, gallic, protocatechuic, ursolic, maslinic, cinnamic, caffeic, gentisic and chlorogenic also present. The leaves, buds and stem tips contain 28-31% protein, and cellulose of 9-10%. Fifty eight grams of fireweed young leaves contains 8 mg calcium, 1 mg iron, 332 RE vit A, 0.49 mg riboflavin, and 57 mg of vitamin C.

Flowers are composed of sexangularetin, chanerol, chanerozan pollen- linoleic, linolenic, lauric, margaric, capric, myristic, myristoleic, nonadecanoic, oleic, pentadecanoic, stearic and palmitic acids. *C. latifolium*- beta sitosterol, and various flavonoids including quercitrin, myricitrin, and isoquercitrin.

Fireweed leaves and flowers are useful for a multitude of skin problems, ranging from psoriasis, to eczema, acne, burns and wounds. The leaf is cool and drying.

Fytokem, a biotech company in Saskatoon, Saskatchewan has produced a patented Canadian willow herb extract with clinically proven anti-inflammatory properties. A flavonol glucuronide is believed to be responsible at least in part. Studies using 5% extract were tested against 1% cortisone cream and a control over a 24 hour period on irritated skin. The extract showed improvement in redness and irritation of 35.5% within the first hour and 40.5% in 24 hours. Cortisone cream had a 10.75% improvement in first hour, and 25.75% over the 24 hour period. Glucuronic acid is a growth factor, and has been used in the past in abdominal surgery, as a detoxifying agent, and in therapeutics for arthritis and rheumatism. The flower can be infused and gargled for sore throat, pharyngitis and laryngitis, and combined with the leaf for insomnia, and relieving of headaches caused by nervousness. The flower juice is very antiseptic, and can be simply squeezed from the fresh petals.

Cool decoctions of the whole plant are used in hiccoughs, whooping cough and asthma, slowly sipped until the spasms subside. Leaf tea is mild, but helpful in cases of persistent, slow hemorrhage

conditions from lungs, nose, bladder or uterus. It is mild and may be combined with cranesbill root, shepherd's purse or fleabane for more severe cases.



Fig. 2 Stand of fireweed on recently burned location

Fireweed leaf decoctions also soothe stomach problems like ulcers, gastritis, and colitis; as well as more serious conditions such as gastric tumors of either a malignant nature or not. Leaf decoctions are demulcent with mild astringency and can be useful in sub-acute stages of diarrhea and dysentery. Watery diarrhea, due to a change of drinking water, is also resolved. Poultices of the fresh leaves and flowers can be applied to inflammations of the ears, throat, and nose.

In arthritis and rheumatism, it plays a role with its anti-inflammatory and kidney cleansing properties. Michael Moore<sup>7</sup> says one of the classic indications for fireweed is chronic, pasty diarrhea, without heat and fever, and green or yellow in color.<sup>1</sup> This is a common complaint in the spring in the North Country, due to changing from a meat and potatoes winter diet to one of green and red spring plants. He continues<sup>2</sup>, some prescription drugs for ulcers, colitis and arthritis can induce a lingering low-level swelling and dryness in the descending colon, and in men, a low-grade prostate heaviness; two or three cups of tea a day for a week will help, and Fireweed has no contraindications with drugs. Traditional eclectic indications were red, dry and contracted tongue, with pinched, emaciated and nearly effaced papillae. The skin also looks dry and contracted with a pinched or emaciated look to face. River Beauty tops contain steroid compounds that act as gastrointestinal astringents that soothe the digestive tract. The leaf contains an unknown substance that, like grapefruit juice, enhances the action of drugs from 4-7 times, according to Mors Korchanski, noted survival expert and former outdoor education instructor with the University of Alberta.

## Homeopathy

Epilobium is for the intractable diarrhea that accompanies typhoid. The dose as a tincture is 10-20 drops as needed. Marsh willow-herb is for high fever coming on at noon, with aching all over and severe headache lasting all night and preventing sleep. Throat filled up in morning, cannot swallow water, larynx sore to pressure, swollen on outside, with hard lumps on both sides. Dull and sleepy, but cannot sleep, the saliva would choke me. In an attempt to swallow water it would fly out of my nose. I prescribe *E. palustre* every day for colds and coughs with phlegm in the throat and fever. It gives good satisfaction when the swallowing is interfered with.

## Flower oil

An excellent sun infused oil can be produced from young flower heads and buds of fireweed. Using as 1:5 ratios weight to volume and set for two weeks, shaking daily in coconut oil. If weather is cool and cloudy, consider a low temperature crock pot to avoid spoilage. A 12 hour wilt of flowers and buds will remove excess moisture and produce a better product. This can later be strained and used for making anal suppositories for hemorrhoids, anal fissures, prostate inflammation, and childhood eczema.

## Hydrosol

Fireweed hydrosol has a most subtle and peculiar fragrance. It has literally no taste so can be taken easily by all ages. Much research needs to be done on the water, but skin conditions such as burns, sunburn and other inflamed states would be worthy of trials. The hydrosol shows anti-microbial effect against a number of bacteria including *Propionibacterium acnes*, associated with pimples, comedones and acne.

## Pharmacological studies

Fireweed (*C. angustifolium*) leaf and flowering tops show strong activity against *Staphylococcus aureus* and *Candida albicans*; and moderate activity against *E. coli* and *Pseudomonas aeruginosa*.<sup>8</sup> Fireweed also inhibits *Klebsiella pneumoniae*, an opportunistic bacterium that is widespread in hospitals.<sup>9</sup> Extracts have been shown effective in treating tinea capitis. The tannins are both anti-fungal and may act as an ileocecal valve tonic in chronic candidiasis. Colic, and other irritated conditions, including chronic diarrhea, are relieved. Work by McCutcheon et al<sup>10</sup> found aerial parts and roots active against all nine fungal species tested. It also completely eliminated elastase activity suggesting skin healing and support. More recent work has found the herb active against various bacteria,

including *Staphylococcus aureus*, *Micrococcus luteus*, *Escherichia coli* and *Pseudomonas aeruginosa* in a manner more effective than vancomycin or tetracycline.<sup>11</sup>

The rhizomes contain fewer tannins, and no mucilage, but contain the flavonoids useful for anti-inflammatory process such as prostatitis and enlarged prostate. The anti-inflammatory and prostaglandin inhibition properties are due in large part to the myricetin 3-O- $\beta$ -D-glucuronide that inhibits release of prostaglandins PGI<sub>2</sub>, PGE<sub>2</sub>, and PGD<sub>2</sub>. It is at optimal levels during and just after flowering. Studies by Lesuisse et al<sup>12</sup> in France found the tannin, oenothien B, from various fireweeds, to be the active compound that inhibits 5 $\alpha$ -reductase in the human prostate. This compound has also been shown to possess anti-viral and anti-tumor activity. Extracts of the herb with administered testosterone increased estrogen receptor alpha activity by 9% and decreased ER $\beta$  by 36% in a rat model.<sup>13</sup>

Fireweed can be a useful in polycystic ovary syndrome, menorrhagia, vaginal weakness, chronic cystitis and acute prostatitis. Oenothien B is found in all species of *Epilobium*. Other work by Ducrey et al<sup>14</sup> found both oenothien A and B inhibit 5 $\alpha$  reductase and aromatase. Aromatase inhibiting pharmaceuticals are widely used in treatment of hormone sensitive cancers in men and women. Kiss et al<sup>15</sup> found oenothien B, extracted from *E. angustifolium*, inhibits proliferation of cell lines with high neutral endopeptidase protein (NEP) expression. This suggests use in disturbed metabolism of signaling peptides by an unbalanced NEP activity. Oenothien B, from this species, exhibits immune modulation both *in vitro* and *in vivo*.<sup>16</sup>

Pharmacological studies comparing *E. angustifolium* and *E. parviflorum* show remarkable similarity with flavonoid content of the former at 6.6% and the latter at 5.9%. Triterpene and sterols were 4.2 and 4.7% respectively.<sup>17</sup> However, water extracts of the former show five times greater anti-inflammatory activity.<sup>18</sup> Fireweed was one ingredient in a multi-herb preparation clinically tested for benign prostatic hypertrophy. The phase II, randomized, double-blind, placebo-controlled trial was conducted on 57 otherwise healthy males aged 40-80 years of age. Treatment with one capsule a day or placebo was conducted for three months. The results showed a significant reduction in international prostate specific score (IPSS) in active group of 36% compared to placebo at 8%. This included both day-time and night-time urinary frequency.<sup>19</sup> Standardized water extracts of three *Epilobium* species were tested for activity against hormone sensitive prostate cancer cell line.

The study suggests their apoptotic activity is related to activation of the mitochondrial pathway.<sup>20</sup>

### Concluding remarks

Further research is sure to find exciting new compounds and pathways in this genus. The evidence of benefit for prostate health is encouraging and will perhaps lead to having fireweed take its spot on the natural health products shelf.

### Conflict of interest

None

### Notes

This mini-review was based on the book *Healing Herbs of the Boreal Forest*.<sup>21</sup>

### References

1. Leighton A, Wild rose plant use by the Woods Cree (Nihithawak) of East Central Saskatchewan. Canadian Ethnology Service Paper No. 11. 1985. National Museums of Canada.
2. Marles R, Clavelle C, Monteleone L, Tays N, Burns D. Aboriginal plant uses in Canada's Northwest Boral Forst. 2000. UBC Press, Vancouver.
3. Newcombe, C. F. Unpublished notes on Haida plants. C. F. Newcombe Accession 1897-47, New York: Department of Anthropology (Belinda Kaye, Registrar for Loans and Archives), American Museum of Natural History, New York.
4. Swanton, J. R. Haida Texts and Myths, Skidegate Dialect. Washington, D.C: Bureau of American Ethnology Bulletin No. 29. Smithsonian Institution. 1905.
5. Brown A. Old Man's Garden. Sidney British Columbia: Gray's Publishing; 1954 P. 94.
6. Milne, Courtney & Sherrill Miller. Visions of the Goddess. Toronto Ontario: Penguin Books; 1998. p. 44.
7. Moore, Michael. Medicinal Plants of the Mountain West. Revised and expanded. Santa Fe: Museum of New Mexico Press; 2003. p. 120.
8. Borchardt JR, Wyse dl, Sheaffer CC, Kauppi KL, Fulcher RG, Ehlke NJ, Biesboer DD, Fulcher RG. Antimicrobial activity of native and naturalized plants of Minnesota and Wisconsin. *J Med Plants Res*. 2008; 2:98-110. [Full Text](#)
9. Battinelli L, Tita B, Evandri MG, Mazzanti G. Antimicrobial activity of *Epilobium* spp. extracts. *Il Farmaco* 2001;56:345-348. [PubMed Full Text](#)
10. McCutcheon AR, Ellis SM, Hancock RE, Towers GH. Antifungal screening of medicinal plants of British Columbian native peoples. *J Ethnopharmacol*. 1994;44: 157-169. [PubMed](#)
11. Bartfay W, Bartfay E, Green Johnson J. Gram-negative and gram-positive antibacterial properties of the whole plant extract of willow herb (*Epilobium angustifolium*). *Biol Res Nurs*. 2012;14:85-89. [PubMed Full Text](#)
12. Lesuisse D, Berjonneau J, Clot C et al. Determination of oenothien B as the active-5-alpha-reductase-inhibiting principle of the folk medicine *Epilobium parviflorum*. *J Nat Prod*. 1996;59:490-492. [PubMed Full Text](#)
13. Kujawski R, Mrozikiewicz PM, Bogacz A. Influence of standardized extract of *Epilobium angustifolium* on estrogen receptor alpha and beta expression in *in vivo* model. *Ginekol Pol*. 2010; 81:600-605. [PubMed](#)
14. Ducrey B, Marston A, Goehring S, Hartmann RW, Hostettman K. Inhibition of 5-alpha-reductase and aromatase by the ellagitannins oenothien A and oenothien B from *Epilobium*. *Planta Medica* 1997;63: 111-114. [PubMed Full Text](#)
15. Kiss A, Kowalski J, Melzig MF. Effect of *Epilobium angustifolium* L. extracts and polyphenols on cell proliferation and neutral endopeptidase activity in selected cell lines. *Pharmazie* 2006;61:66-69. [PubMed](#)
16. Schepetkin IA, Kirpotina LN, Jakiw L et al. Immunomodulatory activity of oenothien B isolated from *Epilobium angustifolium*. *J Immunol*. 2009; 183:6754-66. [Full Text](#)
17. Nowak R, Krzaczek T. Pharmacological research involving herbs of *Epilobium angustifolium* L. and *Epilobium parvifolium* Schreb. *Herba Polonica* 1998;1:5-10.
18. Hiermann A, Juan H, Sametz W. Influence of *Epilobium* extracts on prostaglandin biosynthesis and carrageenin induced oedema of the rat paw. *J Ethnopharmacol*. 1986; 17:161-169. [PubMed Full Text](#)
19. Coulson S, Rao A, Beck SL, Steels E, Gramotnev H, Vitetta L. 2013. A phase II randomized double blind placebo-controlled trial investigating the efficacy and safety of ProstateEZEMax: a herbal medicine preparation for the management of symptoms of benign prostatic hypertrophy. *Compl Ther Med*. 2013; 21:172-179. [Full Text](#)
20. Stolarczyk M, Naruszewicz M, Kiss AK. Extracts from *Epilobium* sp. Herbs induce apoptosis in human hormone-dependent prostate cancer cells by activating the mitochondrial pathway. *J Pharm Pharmacol*. 2013; 65:1044-54. [Full Text](#)
21. Rogers RD. *Healing Herbs of the Boreal Forest*. Edmonton, Alberta. Prairie Deva Press 2013.



This work is licensed under a Creative Commons Attribution-Non Commercial-No Derivatives 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>