

VIPER'S BUGLOSS and related species

Echium spp.

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Introduction

After nearly 500 years there are some plants that have faded almost into obscurity. Borage (*Borago officinalis*) was a similar victim of neglect until the seed oil was discovered and the plant re-christened the Starflower. Now a close relative to the Viper's Bugloss, *Echium plantagineum* - the Blue Cats Tail has risen from the ashes with an oil that surpasses Evening Primrose oil, Starflower and Blackcurrant seed oils, with a fatty acid profile and skin benefits that are outstanding.

Properties of Echium oil

The main benefit and the 'driver' behind the current high level of interest in the seed oil of *Echium plantagineum* follows the greater understanding and research work invested in the oils unique fatty acid properties. Echium oil contains all the essential fatty acid's (EFA's), along with significant levels of gamma-linolenic acid (GLA). The value of EFA's and their good emollient properties are already well known to the personal care market. Oils with a high proportion of EFA's, such as Hemp oil and Gold of Pleasure oil, are becoming increasingly popular for use in skin care applications. GLA is also widely recognised for its positive effect on skin health and Evening Primrose oil, Borage oil and Blackcurrant seed oil are currently utilised by cosmetic formulators for this reason.

Fig 1. Typical Fatty Acid Profile of Echium Oil

Fatty Acid	Carbon Length	Content %
Palmitic Acid	16:0	6-8
Stearic Acid	18:0	3-5
Oleic Acid	18:1	15-19
Linoleic Acid	18:2n-6	14-18
Gamma Linolenic Acid	18:3n-6	9-12
Alpha Linolenic Acid	18:3n-3	28-33
Stearidonic Acid	18:4n-3	10-14

Although the high levels of EFA's and GLA are undoubtedly of interest, it is the stearidonic acid (C18: 4n-3) content of Echium oil that makes it unique among plant seed oils. Stearidonic Acid is an omega-3 fatty acid that has been shown to exhibit strong anti-inflammatory properties. Echium oil contains between 12 and 14% stearidonic acid, compared to 2% found in the only other available commercial source, Blackcurrant seed oil.

Fig. 2 Typical gamma-linolenic and stearidonic acid content of plant seed oils		
	Stearidonic Acid	gamma- Linolenic Acid
Blackcurrant Seed	2-3%	10-15%
Borage	-	20-23%
Evening Primrose	-	8-11%
Echium	11-14%	9-12%

The recent high level of interest in fish oils by the health food sector has been stimulated by the realisation that the western diet does not contain a sufficient proportion of omega-3 fatty acids. Echium oil not only contains significant levels of omega-3 fatty acids but also has the tremendous advantage of being derived from a naturally renewable plant source. A combination of these factors has led to interest in using Echium oil as a dietary supplement and perhaps, in the near future, as an ingredient in 'functional foods'. However, in the short term, it is the skin-care application of this oil that is of greater interest.

Considerable research has been carried out into the effectiveness of stearidonic acid as a systemic treatment of eczema, acne and other skin disorders. Leukotrienes have been shown to be important mediators in various disease processes, including asthma and inflammation and stearidonic acid was shown to reduce leukotriene synthesis by up to 50% by acting as an inhibitor of the 5-lipoxygenase pathway (Guichardant et al 1993). It is very possible that a pharmaceutical application using stearidonic acid derived from Echium oil, as its active ingredient will be developed in the future.

Echium oil has also shown very useful properties when applied topically and it is this that will be of most interest to the Personal Care market. Two areas where Echium oil would seem to have obvious application are for after-care, following exposure to sun and anti-wrinkle applications.

UV radiation induces the release of arachidonic acid from cell membrane phospholipids, which is converted via a series of steps into inflammatory metabolites such as prostaglandin E2. The diagram below shows the dramatic effect Echium oil has on the release of prostaglandin E2. When applied topically to a skin model, Echium oil inhibited the release of PGE2 by nearly two thirds when compared to untreated tissue. Other oils that were shown to have a limiting effect on the release of PGE2 were Blackcurrant seed oil and Trichodesma oil – both of which contain low levels of stearidonic Acid. (K Coupland et al 1996)

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Work has also been carried out investigating the use of Echium oil as an anti-wrinkling agent. –K. Coupland AOCS meeting Florida (1998) A study was performed comparing the effect of a cream containing 5% Echium oil and a control cream with a non-stearidonic acid vegetable oil on skin rugosity over a 28-day period. There were ten subjects in each group. It can be seen from the diagram below that the application of Echium oil resulted in a statistically significant reduction in both the main wrinkles studied and the average skin roughness.

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The significant levels of EFA's and GLA contained in Echium oil should alone warrant interest, whilst the recent and ongoing research highlighting stearidonic acid's important role in reducing skin inflammation shows that Echium oil is unparalleled in its effectiveness for skin-care applications.

The history of this plant opens with a description by Culpeper

Description : This hath many long rough leaves lying on the ground, from among which rises up divers hard round stalks, very rough, as if they were thick set with prickles or hairs, whereon are set such like rough, hairy, or prickly sad green leaves, somewhat narrow; the middle rib for the most part being white. The flowers stand at the top of the stalk, branched forth in many long spiked leaves of flowers bowing or turning like the turnsole, all opening for the most part on the one side, which are long and hollow, turning up the brims a little, of a purplish violet colour in them that are fully blown, but more reddish while they are in the bud, as also upon their decay and withering; but in some places of a paler purplish colour, with a long pointel in the middle, feathered or parted at the top. After the flowers are fallen, the seeds growing to be ripe, are blackish, cornered and pointed somewhat like the head of a viper. The root is somewhat great and blackish, and woolly, when it grows toward seed-time, and perishes in the Winter. There is another sort, little differing from the former, only in this, that it bears white flowers.

Place : The first grows wild almost every where. That with white flowers about the castle-walls at Lewis in Sussex.

Time : They flower in Summer, and their seed is ripe quickly after.

Government and virtues : It is a most gallant herb of the Sun; it is a pity it is no more in use than it is. It is an especial remedy against the biting of the Viper, and all other venomous beasts, or serpents; as also against poison, or poisonous herbs. Dioscorides and others say, That whosoever shall take of the herb or root before they be bitten, shall not be hurt by the poison of any serpent. The root or seed is thought to be most effectual to comfort the heart, and expel sadness, or causeless melancholy; it tempers the blood, and allays hot fits of agues. The seed drank in wine, procures abundance of milk in women's breasts. The same also being taken, eases the pains in the loins, back, and kidneys. The distilled water of the herb when it is in flower, or its chief strength, is excellent to be applied either inwardly or outwardly, for all the griefs aforesaid. There is a syrup made hereof very effectual for the comforting the heart, and expelling sadness and melancholy.

A later version of the same book [Potterton] says that the herb stimulates kidney functions, soothes inflammatory conditions and increases expectoration. The lower leaves are made into an infusion, and used to produce sweating in fevers. This is also good for headaches, nervous conditions and to allay the pain due to inflammation. The seeds are administered as a simple decoction to improve lactation, but alcoholic wines are contra-indicated in pregnancy and nursing mothers.

Alternative names

A member of the Boraginaceae family. The plant is known as Blue Weed [Stuart, 1979; Stuart, 1986] or Blueweed [Bremness], Viper's Bugloss, Blue Cats' Tails, Ironweed, Our Lord's Flannel, Snakes' Flower [Ceres]. In other languages Viperine vulgaire (F), Natternkopf (D), Viperina comun (E). The generic name derives from the Greek *ekios*, a viper, referring to the resemblance the fruit bears to the head of such a creature [Chiej, Wren, 1985], though in another reference we learn that its generic name *Echium* is derived from *Echis*, a viper [Grieve]. The name Bugloss, which is of Greek origin, signifies an Ox's Tongue, and was applied to it from the roughness and shape of the leaves [Grieve].

Plant constituents

The plant contains tannins and an alkaloid [Stuart]. Root contains healing allantoin [Foster & Duke] Many species of *Echium* contain alkannins [Wren, 1994]. The flowering tops contain mucilage, cynoglossin, consolicin, nitrates, and tannin [Chiej].

According to another source: Echimidine; 7-Angelyl-9-echimidinylretronecine is found in *Echium plantagineum*, and honey derived from the nectar of this plant, in *E. italicum*, and *E. lycopsis*. [El-Shazly *et al.*; Harborne] In the Tyrol people are warned not to eat this plant because it stimulates sexual desire [Launert].

Plant uses

Dioscorides advised: "if the leaves be held in the hand, no venomous creatures will come near the holder to sting him for that day" [Wren, 1994].

Gerard writes: "The herbe chewed and the juice swallowed downe is a most singular remedy against poison and the biting of any venomous beast; and the root so chewed and laid upon the sore workes the same effect" [Wren, 1985]. Interestingly, the author could not find this reference in Gerard and noted in the revised edition of Potters Cyclopaedia, that this reference had been removed.

Coles in his *Art of Simples*: 'Viper's Bugloss hath its stalks all to be speckled like a snake or viper, and is a most singular remedy against poyson and the sting of scorpions. [Grieve]

Parkinson says: 'the water distilled in glasses or the roote itself taken is good against the passions and tremblings of the heart as also against swoonings, sadness and melancholy.' [Grieve]

The dried herb is used as a weak diuretic and weak diaphoretic [Stuart, Wren, 1994]. A simple mild tonic infusion is useful in treating nervous headache [Bristow] or the common cold. It was a respected plant for the treatment of viper's venom in earlier times [Stuart, Ceres]. Made with young leaves in the usual way, helps those with chest troubles and soothes tired nerves. It is also said to act as a cheering, cordial herb [Brook; Ceres].

The whole plant and the root are used. Leaf tea used as a folk medicine, used to promote sweating, diuretic, expectorant, soothing; used for fevers, headaches, nervous conditions, pain from inflammation. [Foster & Duke]. It has also been described as a demulcent [Wren, 1985] and the juice is used as a soothing emollient for sensitive skin and in a poultice for treating boils. The plant is cited for the treatment of epilepsy [Launert].

The flowers are crystallised and added to salads [Bremness, 1994; Bremness, 1991], and the flowering tops can be applied to boils. A leaf infusion also helps to reduce inflammatory pain [Bremness, Wren, 1994].

According to some, it is the flowering tops that are used [Chiej], which are antitussive, diuretic, and vulnerary. The plant is used as an infusion, juice, powder, tincture, medicinal wine.

The young leaves contain similar properties to borage and can be eaten in the same way in salads [Chiej, Phillips & Fox], though another says that the young leaves and shoots are treated and eaten like spinach [Launert].

The fresh flowering tips can be chopped up to make poultices for treating whitlows and boils [Chiej].

The root gives a red fabric dye [Chiej, Bremness], and the herb juice is an emollient for weathered skins [Bremness] or reddened and delicate skins [Chiej].

Antimicrobial properties

There is evidence that these extracts have antimicrobial properties. Alkaloid extracts inhibited the growth of *Escherichia coli* (MIC of 1.7 mg/ml) [El-Shazly *et al.*]. Honey from bees on vipers bugloss in New Zealand has been shown to have antibacterial activity [Internet]. Other papers have shown antimicrobial activity in other species [Tabata *et al.*], as well in other honeys [Allen *et al.*].

Dosage

The infusion of 1oz in 1 pt of boiling water is given in wineglassful to teacupful doses as required [Wren, 1985]. The taste is mucilaginous; it is odourless [Wren, 1994].

The seed oil

The seed oil of this species has also been under investigation for possible applications in nutrition, pharmaceuticals and cosmetics.

Nineteen species of the genus *Echium* (Fam. Boraginaceae) collected in Macaronesia were surveyed in a search for new sources of gamma-linolenic acid (GLA, 18:3 Omega-6). High amounts of this acid were found in all of them, ranging from 9.15% (*E. plantagineum*) to 26.31% (*E. callithyrsum*) of total seed fatty acids. The amounts of GLA related to total seed weight were also significant, ranging from 1.77% (*E. sventenii*) to 5.02% (*E. nervosum*). In addition, considerable amounts of stearidonic acid (SA, 18:4 Omega-3) were detected, ranging from 3.03% (*E. auberianum*) to 12.94% (*E. plantagineum*) of total fatty acids. These data allow us to consider the members of the genus *Echium* from Macaronesia as one of the richest sources of gamma-linolenic acid found so far in nature. [Guil-Guerrero *et al.*]

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