

***Artemisia arborescens* - essential oil of the Pacific Northwest: a high-chamazulene, low-thujone essential oil with potential skin-care applications**

by
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Introduction to the Artemisia family:

Artemisia is a fairly large genus within the family of the *Asteraceae* (*Compositae*), with 200 individual species known, which are usually found in dry areas. They are invariably found as small fragrant shrubs or herbs and most yield essential oils. Some of these oils have found uses in perfumery and medicine (as, for example, vermifuges, stimulants, etc.) whereas the leaves of some species are used as culinary herbs. The plants themselves as are popular among gardeners as cultivated ornamentals.

Several of the species that produce essential oils are found in the chart below:

Plant	Common name	Habitat	Herb or Essential oil use¹	Safety info
<i>A. afra afra</i> von Jacquin	Lanyana, layana, African absinthe, wildeals, South African wormwood		Herb: Anticatarrh, antimigraine, mucolytic, vermicide ¹ vapor from boiling leaves inhaled for respiratory ailments ² EO: exhibits anti-fungal activity ³	No formal safety testing of EO; appears possible irritant, moderately toxic; potentially very toxic
<i>A. abroatanum</i> L.	southernwood, lads love, old man	S. Eur	Herb: digestive, antihelmintic, emmenagogue EO:	No formal safety data: presumed toxic
<i>A. absinthium</i> L.	absinthe, absinthium, wormwood, green ginger, armoise	Eur.	medicinal and absinthe (harmful liqueur; source of Afsanteen, a drug used in chronic fever, swellings and inflammation of the liver- one of ² ; useful as tonic and stimulant EO: antihelmintic, insect repellent, digestive stimulant, mild tonic, febrifuge One of best sources of azulene ⁴	EO: Tested at low doses non toxic; non irritant and non sensitizing; banned for use based on absinthe poisoning..
<i>A. annua</i> L.	Annual wormwood, sweet Annie	Europe, naturalized in N. America	Herb: efficacious antimalarial in China (huanghuahaosu); EO: antihelmintic, antispasmodic, carminative, mucolytic,	No formal safety testing of EO; presumed moderately toxic
<i>A. arborescens</i>	artemesia, great mugwort, arborescent mugwort	Morocco, Pacific NW USA	EO: anti-inflammatory, antihistamine, anticatarrh, choloretic, mucolytic	No formal safety testing; appears safe at low doses

<i>A. cina</i> Berg ex Polj	Levant wormseed, Turkestan		Herb: medicinal, antihelmintic (santonin) known as santonica	N/A
<i>A. drancunculus</i> L.	tarragon	Euras	leaves as aperient, stomachic, stimulant, febrifuge, spice for flavoring (vinegar, with fish); EO: antihelmintic, antibacterial, anti-inflammatory antispasmodic, carminative	Tested at low dose, not toxic, non irritant, non sensitizing Mutagenic data
<i>A. glacialis</i> L and <i>A. Laxa</i> (Lam.) Fritsch		Alps	Herb: flavoring for genepi liqueur	N/A
<i>A. herba alba</i> Asso	White mugwort Two types davanone type (up to 55% davanone) (P&F) and thujone type (up to 71 % α -thujone, camphor	Med	Herb: wormwood of the Bible; EO: anti-infectious, antibacterial, ⁵ emmenagogue, lipolytic, mucolytic, cholagogue, parasiticide, viricide (the genuine "Armoise oil" of perfumery)	EO: Non-irritant, non-sensitizing, and non-phototoxic. Assumed very toxic.
<i>A. maritima</i> L.		Euras	Herb: Source of santonin (vermifuge and antifertility drug) ³ used as decongestant, stomachic, laxative and tonic EO: thujone ⁶ , cineole, several monoterpenoids ⁷	No formal testing of EO: assumed very toxic
<i>A. pallens</i> Wall	Davana		Herb: often grows in neighborhood of sandalwood trees; important component in garlands and bouquets in India; EO: used in flavor (cakes, pastries, tobacco and costly beverages); Anticatarrh, bactericidal, cicatrizant, mucolytic, nervine (anti anxiety, low dose) Main constituent: davanone	EO: Non-irritant, non-sensitizing and non-phototoxic. Low toxicity
<i>A. pontica</i> L.	Roman wormwood	SE Europe	Herb: flavor of vermouth	
<i>A. silversiana</i> Ehrh ex Willd.			Herb: tonic, deobstruent, febrifuge, anthelmintic, and antiseptic; used as fodder EO: reported as a good source of Chamazulene ⁸	N/A
<i>A. tridentata</i> Nutt	"sage brush" of the south west USA. Unfortunately being wind pollinated are often the source of hayfever problems	N. America	Herb: used medicinally also as tea	N/A
<i>A. tilesii</i> Ledeb		Arctic	Herb: Medicinal (Eskimos), properties like codeine ⁹	N/A
<i>A. vulgaris</i> L.	Common mugwort, armoise, Indian wormwood	Euras	Herb: Leaves condiment, also used in moxibustion, and magic and superstition EO: Antihelmintic, antispasmodic, stimulant, tonic, vermifuge	Eo: oral toxin, low dose on skin: non irritant, non-sensitizing

Historical

Artemisia arborescens is a morphologically highly variable species (or mixture of species) with gray-green to silver leaves. It is native to the various habitats of the Mediterranean region, where it occurs as a shrub to one meter in height. According to popular folklore, the plant was spread by Moorish invaders and Knights Templar during the times leading up to the Crusades.

Colonies of *A. arborescens* from the European shores and the Mediterranean islands



may have originated in North Africa or the Middle East. Most members of the species are highly scented. Some versions or cultivars are grown and highly prized in British gardens and these may be difficult to classify botanically as many have similar characteristics

***Artemisia* varieties**

The NCCPG Artemisia Collection ¹⁰ currently holds the following variants of "arborescens":

Named cultivars: Brass Band, Faith Raven, Porquerolles, Powis Castle; and other versions: "Crete", Hort, Barcelona, Madrid, Oldenburg.

Vapor profiling was carried out on Brass Band, Faith Raven and Powis Castle, and all were found to be markedly similar in composition. Thujone was prominent, however the chromatogram was different from *A. absinthium* (wormwood). Twibell considers that

vapor profiling gives a permanent scientific record of the odor of scented plants and can be used to aid taxonomic determination or discrimination.¹¹

Additional methods of classification

Barberlo, *et al.* (1991), combined methods of headspace sampling, thermal desorption, and capillary GC and successfully resolved the variant of *Artemisia* and use of mass spectral data provided help in identifying interesting components. This article clearly shows that the cultivar Powis castle appears to share a common ancestry with two other similar cultivars (Brass Band and Faith Raven), originally from Greece. However it is unlikely that it is a hybrid between *A. absinthium* and *A. arborescens*.¹²

However, Tucker et al., 1993, said that when elucidation of the inheritance of essential components in the genus *Artemisia*, the essential oil of Powis Castle does not contradict a putative origin from *A. Absinthium* x *A. arborescens*.¹³

Few analysis have been reported for *A. arborescens*, but two have been characterized: the high chamazulene type and the high beta-thujone type (Codignola, 1984.)¹⁴

Odor description:

Moroccan high thujone type: Deep blue to blue black oil with odor characteristic of plant and distinctly thujone-like; powerful, minty and woody, with a definite slight milk-like note presence. Dry-out is creamy fruity-with the impression of a fruity (almost apricot/raspberry) note with some lactonic character.

Pacific NW high chamazulene type: In contrast to the thujone type, this deep blue-black colored high chamazulene type of oil does not present a thujone character, but is more low-key in impact being fresh, slightly sweet, slightly minty at first, becoming much more minty after five minutes, with a lift reminiscent of angelica seed oil. There is also a hint of fruitiness. The dry-out is minty, fruity-apricot, sweet with some fresh tobacco leaf character. In comparison to the normal type, the dry-down of the Pacific NW type is more fruity, and makes the normal type look woodier and soapier in comparison.¹⁵

History: The particular oil discussed in this paper was from George Sturtz, (Oakville Herb Farm, Albany, Oregon, USA), a producer who has spent years experimenting with producing the oil in Oregon. The probable introduction of the plant was via a herb grower and collector from southern Oregon about 10 years ago. At the time, Sturtz was collecting new accessions to see what the potential was for production. Most of his life's work has dealt with finding uses for the native plants of the Northwest. He has also collected many aromatic plants from other parts of the world. He became interested in the *Artemisia* genus after reading a PhD dissertation about 20 years ago. Amazed at how little was known of this genus in America, and particularly in the NW, he began to study, grow and distill the plants he collected to determine their usefulness from oil production and culture. *A. arborescens*, like some other *Artemisias* have azulenes of

various kinds in their oils. *A. arborescens* oil has the highest amount of chamazulene of any essential oil known.

Plant Habitat

The plant is hardy in the north-west USA only during winters of very mild temperatures, otherwise it must be propagated and transplanted as an annual every year, making it costly. The above mentioned producer maintained the original plants in the greenhouse, as the plant is not hardy in climates that get much below freezing. The wet and cold usually kill it quickly. The plant is propagated by tip cuttings. The plant was identified by university herbarium specimens and flora of Europe.

Yield:

The yield of oil is quite low, only about 0.3%. The oil is also hard to isolate, since some fractions are heavier than water requiring special techniques to recover the oil. One can also try to influence the density of the water.

Growing Trials

A trial was carried out in Spring 1999 harvesting and distilling the aerial parts of approximately 700 cultivated plants, which gave a total oil yield of 280 g. The season was cooler than normal, and yields of other essential oil crops was also depressed by about 15-20%. He calculated to figure the yield per acre around 10 to 12 lbs. The price would have to be around \$1000/lb. to be economically feasible at current conditions. Plants are harvested at the end of the growing season, about mid October.

Chemistry

Azulene content

The azulene content may vary from season to season, last year reaching record highs of about 40%. Chemical information on previous distillations of the Northwest type oil can be found in the 1993 JEOR article. A side by side comparison of the chemical breakdown of the high thujone type with the high chamazulene type is given below.

Comparison of Moroccan and American *A. arborescens* Oil

<i>Artemisia arborescens</i>	Morocco	USA
	High thujone type	High Chamazulene type
Component	Area %	Area %
alpha-thujene	0.31	0.35
alpha-pinene	3.00	3.24
camphene	2.71	2.81
sabinene	3.99	0.23
myrcene	9.10	5.05
alpha-Terpinene	1.65	1.11
para-Cymene	2.10	1.04
Limonene	1.17	1.06
gamma-Terpinene	4.12	1.86
E-Sabinene hydrate	1.07	2.87
Linalol	2.06	0.65
alpha-thujone	1.00	nd
beta-Thujone	30.06	nd
camphor	21.67	16.71
Terpinen-4-ol	3.34	2.05
alpha-Terpineol	0.37	0.19
copaene	0.27	0.44
beta-bourbonene	0.24	0.21
beta-Caryophyllene	0.37	3.56
Germacrene D	2.03	7.15
Chamazulene	1.45	39.60
unident. diterpene	nd	8.91

Discussion:

Interestingly, not only does the Northwest type exhibit more than 20 times the chamazulene level of the typical Moroccan type but it also has no detectable amounts of thujone, which is obviously desirable from a toxicity standpoint. In addition, the Northwest variety also contained a relatively high amount of an unidentified diterpene. Diterpenes, when they are present, are rarely found at greater than 1% in essential oils. Whether or not this diterpene would have any potential therapeutic effects is a topic that needs further investigation.

With a chamazulene content, typically ranging from 30 - 40%, the Northwest variety of *A. arborescens* is at the top of the list of known chamazulene containing oils. The table below is a comparison the title oil with the other primary chamazulene oils.

Comparison of the Main Chamazulene Containing Oils

Botanical Oil	Typical chamazulene %
American Arborescens (<i>Artemisia arborescens</i>)	30 -40%
Yarrow or Milfoil (<i>Achillea millefolium</i>)	2-27%
German chamomile (<i>Matricaria chamomilla</i>)	2-12%
Blue tansy (<i>Tanacetum annuum</i>)	1-3%
Moroccan Arborescens (<i>Artemisia arborescens</i>)	1-2%
Wormwood or Mugwort (<i>Artemisia absinthum</i>)	0-4%

Effects and Efficacy

Essential oils that contain chamazulene are important in therapeutic applications because of its apparent radical scavenging activity. Interesting research supporting this activity was carried out by Rekka (1996), who investigated the role of chamazulene *in vitro* experiments using an iron(II)/ascorbate system to generate hydroxyl radicals inducing membrane lipid peroxidation in liver microsomes. It was seen that chamazulene was a potent hydroxyl radical scavenger and effectively inhibited lipid peroxidation.¹⁶ The ability of chamazulene in radical scavenging is what is thought to be responsible for its effectiveness in treating inflamed skin conditions.

Artemisia arborescens was shown to have weak antibacterial action except towards *Clostridium sporogenes* when tested with twenty-five test bacteria.¹⁷

Skin care applications may include: burns, sensitive skin, acne, keratosis, sunburn, inflammations & infections of the skin (Ikan, et al. 1993); Untested oil, avoid use on sensitive or damaged skin

For respiratory problems, inhalation could be beneficial for bronchitis, (asthmatic & catarrhal), coughs, sinus and chest congestion,

Practical uses: this author (SSH) has successfully used this oil in:

- inflamed skin conditions including pre- and post-radiation treatments (as compress and water spray); sunburn (water spray)
- topical treatment for inflamed and sensitive skin (5%) and for surgical scars (mixed 1:1 with *Helichrysum italicum*, 5% formulation in fractionated coconut oil;
- inhalation for respiratory infections, and inflamed sinus (see below)
- topical sinus treatment (5%) (mixed with tea tree, and peppermint 2:10:2).

Typical aromatherapy uses of *A. arborescens* include: anti-inflammatory, antiallergenic(? (Penoel), antihistamine, anticatarrh, choleric, mucolytic, (Sheppard Hanger, 1995)

Conclusion: Because this oil has had no formal safety testing, it is best avoided in pregnancy, and for babies & children. But it appears safer than other *Artemisia arborescens* oils because the thujone content is negligible. They would tend to be in the moderately toxic category. Thujone, which can be quite toxic, occurs in two isomeric forms, the α -form being considerably more toxic than the β -form. This particular oil has a negligible amount of either.

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