Grape seed oil
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BOTANY

*Vitis vinifera* L. belongs to the Vitaceae family. Common name grapevine or grape; it is a perennial woody vine with stems up to 35 m long although in cultivation, it is usually pruned to 1–3 m. Leaves are thin, circular to circular-ovate, 5–23 cm broad, margins dentate or jagged, 4–5-lobed, glabrous opaque-green above, tomentose gray beneath. Flowers are numerous, in dense clusters opposite to leaves. The fruits—called grapes—are small, pulpy berries, 6-12 mm in diameter, with different shapes: globose, oblong, etc. and colors varying with the variety: green, red, purplish-black, etc. The number of seeds also varies between 2 and 4.

A grape is composed of:

- Petiole: grape extremity inserted in the woody vienshoot.
Skin: thin layer enveloping the grape
Pulp: fleshy part of the fruit containing the must or juice.
Seeds: inside the grapes, with a hard woody external layer; seeds are different for the different grapevine varieties. A single grape has usually 4 seeds, because they are born from two ovaries, each with two ovules. However, since fecundation may be incomplete, the number of seeds ranges from 1 to 4.

Grapevine is native to the Mediterranean area and Asia Minor; at present it is cultivated worldwide.

Grape seed oil is produced by hexane extraction of the seeds of Vitis vinifera.

CHEMISTRY

Unsaturated fatty acids

Baydar, N.G. & Akkurt, M. (2001) examined the oil contents and some oil quality properties of seeds taken from 18 grape cultivars. The results showed that the oil concentration of seeds ranged from 11.6 to 19.6%. The degree of unsaturation in the grape seed oil was over 86%. The authors observed that grape seeds were rich in oleic acid (17.8-26.5%) and linoleic acid (60.1-70.1%).

Unsaponifiable

Phytosterols (0.5-1%): β-sitosterol. Phytosterols are vegetable sterols. Their chemical structure and the function are similar to those of cholesterol, a sterol of animal origin.

Phospholipids

Phosphatidylycerine, phosphatidylinositol, lecithin, cephalin, cerebrosides and phosphatidic acid. Phospholipids are ionic lipids composed of a cholesterol molecule and two fatty acids (1,2-diacylglycerol) with a phosphate group. The phosphate group is attached – by means of a phosphodiester bond – to other often nitrogen-containing group (choline, serine, ethanolamine). Usually, the molecule is electrically charged. Cell membranes consist in phospholipids bilayers. The best studied phospholipids are: phosphatidylinositol, phosphatidic acid and phosphatidylycerine. Phospholipids also account for about 50% of lecithin.
Proteins

Proteins in grape seeds (7-10%) are composed of the following amino acids: arginine, cysteine, leucine (11.4%), valine and phenylalanine.

TRADITIONAL USES

*Vitis vinifera* is one of the most extensively used species since the times of most ancient civilizations existing of the Earth. Mentions to vineyards and wine can be found in Egyptian hieroglyphics dated 2400 B.C. and in a number of Bible verses. Hippocrates, Theophrastus, Galen, Dioscorides and Pliny mentioned medicinal properties of wine. They recommended red wine as a tonic and astringent, and white wine as a diuretic.

Oil extracted from grape seeds is used a dietary complement. In southern Africa, grape seed oil is used as a laxative, antacid, cholagogue and wound healing medicine.

COSMETIC PROPERTIES

Skin barrier function repair activity

The essential fatty acids (EFA) are: linoleic acid (LA) and α-linoleic acid (ALA). Since the human organism cannot synthesize EFAs, they must be incorporated from the environment. Fatty acids are essential in the synthesis of tissular lipids; they play a major role in the regulation of cholesterol levels; they are also prostaglandin precursors. Application of fatty acids gives the skin flexibility and a younger appearance, and makes the hair glossier and healthier looking. Fatty acids deficiency produces conditions such as hair-loss and eczema and impairs the efficacy of the immune system. Reduced levels of essential fatty acids result in thickened epidermis, hyperplastic and irregular basal layer, and denser stratum corneum. Fatty acids deficiency causes deterioration of the epidermal barrier function and a consequent loss of water through
the stratum corneum; this in turn, causes several skin disorders such as dry skin or dermatitis (Ranson W., 1993). It has been found that patients suffering dermatitis have low tissular levels of all of linoleic acid polyunsaturated derivatives. A number of clinical tests demonstrated that local applications of linoleic acid (as well as its polyunsaturated derivatives) soothe the skin and reduce trans-epidermal water loss (Wright S., 1991). Conti A. et al. (1995) and Jiménez-Arnau A. (1997) also verified these properties of linoleic acid. Furthermore, dry skin has low linoleic acid levels, which can be restored to normal by topical applications of linoleic acid-rich emulsions (Härtel, B., 1996). Rieger, M. (1987) found that topical application of pure linoleic acid to treat fatty acid deficiency in mouse-ear skin, reduced the transepidermal water loss in 48h. A treatment with pure oleic acid on the contralateral ear did not reproduce these results.

Thus, grape seed oil is highly recommendable to formulate cosmetic products with skin-repair activity.

Antimicrobial activity

Palma, M. et al. (1999) carried out a study, where grape seeds were subjected to sequential supercritical fluid extraction. By increasing the polarity of the supercritical fluid using methanol as a modifier of CO₂, it was possible to fractionate the extracted compounds. Two fractions were obtained; the first (fraction A), which was obtained with pure CO₂, contained mainly fatty acids, aliphatic aldehydes, and sterols. The second fraction (fraction B), obtained with methanol-modified CO₂, had phenolic compounds, mainly catechin,
epicatechin, and gallic acid. The fractions were bioassayed. Antimicrobial activities were checked on human pathogens, and a high degree of activity was obtained with both fractions although fraction A showed stronger effects.

Table 1 shows the antimicrobial effects of fractions A and B of grape-seed extract and of catechin and epicatechin against human pathogens.

<table>
<thead>
<tr>
<th>Organism</th>
<th>Fraction A</th>
<th>Fraction B</th>
<th>Catechin</th>
<th>Epicatechin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1500 1000 500</td>
<td>1500 1000 500</td>
<td>1500 1000 500</td>
<td>1500 1000 500</td>
</tr>
<tr>
<td>Bacillus cereus</td>
<td>- - - - - -</td>
<td>- - - - - -</td>
<td>- - - - - -</td>
<td>- - - - - -</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>+ - - + +</td>
<td>- - - - - -</td>
<td>+ + - - - -</td>
<td>+ - - - - -</td>
</tr>
<tr>
<td>Staphylococcus coagulans niger</td>
<td>++ ++ ++ +</td>
<td>++ ++ ++ +</td>
<td>++ ++ ++</td>
<td>++ ++ ++</td>
</tr>
<tr>
<td>Citrobacter freundii</td>
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<td>- - - - -</td>
<td>- - - - -</td>
<td>- - - - -</td>
</tr>
<tr>
<td>Escherichia cloacae</td>
<td>++ ++ + +</td>
<td>++ ++ ++</td>
<td>++ ++ ++</td>
<td>++ ++ ++</td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>+ + - - +</td>
<td>- - - - -</td>
<td>- - - - -</td>
<td>- - - - -</td>
</tr>
<tr>
<td>Aspergillus flavus</td>
<td>- - - - -</td>
<td>- - - - -</td>
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<td>- - - - -</td>
</tr>
</tbody>
</table>

Table 1. Antimicrobial effects of fraction A, fraction B, catechin and epicatechin against human pathogens.

4mm disc impregnated with selected concentrations of fraction A or fraction B.

++, strong inhibition (diameter > 15mm); +, inhibition (15mm > diameter < 10mm); -, no inhibition (diameter < 10mm).

Table 1 shows that fraction A exerted the strongest antimicrobial action against *S. coagulans niger*, *E. cloacae*, *C. freundii* and *E. coli*. The later bacteria were sensitive to all tested concentrations of fraction A, even the lowest one. *S. aureus* was only moderately sensitive to the highest concentration. *B. cereus* and the fungus *A. flavus* were resistant to fraction A at every concentration. In the literature, there are reports concerning the modulation properties of sterols over the bioactivities of other compounds, so it may be possible that sterols produced the effects shown by fraction A. The antimicrobial action of fraction B was weaker than that of fraction A.

Thus, grape seed oil is of great use to formulate cosmetic products with disinfectant or purifying activity.
Finally, we would like to mention a monograph included in *Plants preparations used as ingredients of cosmetic products* (Council of Europe Publishing, 1994) on *V. vinifera* fruits extract, *V. vinifera* seed oil and *V. vinifera* leaves extract, where the following cosmetic properties are attributed to these preparations:

- **fruit**: colorant (anthocyanins), protective, moisturizing
- **seeds**: emollient, protective, anti-aging
- **leaves**: tonic, astringent, refreshing (tannins) anti-aging
- Maximum recommended concentration is 15% for lotions, creams, aged-skin care gel and hair products.

Other possible effects are:

- **polyphenols**: free radical scavengers, micro-circulation protective, anti-irritant, antioxidant
- **unsaponifiable**: granulation-promoting agent

### COSMETIC APPLICATIONS

<table>
<thead>
<tr>
<th>Action</th>
<th>Active</th>
<th>Cosmetic application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin barrier function repair</td>
<td>Linoleic acid</td>
<td>Skin repair</td>
</tr>
<tr>
<td>Antimicrobial</td>
<td>Fatty acids</td>
<td>Purifying</td>
</tr>
<tr>
<td></td>
<td>Sterols</td>
<td>Antiseptic</td>
</tr>
</tbody>
</table>

### RECOMMENDED DOSE

The recommended dose is between 0.5% and 5.0%.

### BIBLIOGRAPHY


Palma M, Taylor LT, Varela RM, Cutler SJ, Cutler HG. *Fractional extraction of compounds from grape seeds by supercritical fluid extraction and analysis for antimicrobial and agrochemical activities*. J Agric Food Chem, 1999; 47(12):5044-5048.


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