Possible applications of some commercial seed oils in the treatment of *stomatitis protetica* and *halitosis*

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Summary

The purpose of this study was to exam some commercial seed oils as to the presence of natural compounds which could be helpful in the adjunct treatment of *halitosis* and *stomatitis protetica*. We examined eight commercial seed oils by spectrophotometer and HPLC analysis in comparison to the analytical standards. Using analytical methods we established the presence of chlorophyll, β-carotene and tocopherols in the analysed materials. Pumpkin oil, containing the highest amount of chlorophyll and β-carotene and a medium concentration of total tocopherols, could be the most effective in the adjunct treatment of *halitosis* and *stomatitis protetica* in the whole group of the examined seed oils.

Key words: seed oils, stomatitis protetica, halitosis

Stomatitis has a multifactorial aetiology [1, 2]. One of the causes can be mechanical injuries of gums by dentures, which can be alleviated by treatment with such vitamins as tocopherols and carotens. Bad breath often accompanies prosthetic stomatopathy. *Halitosis* predominantly originates from the tongue coating, gingival crevice and periodontal pockets. Plaque organisms, especially *Porophyromonas gingivalis*, fusobacteria and other anaerobes cause putrefaction resulting in release of volatile chemicals, particularly sulphide compounds (including hydrogen sulphide, methylmercaptan, dimethyl sulphide and dimethyl disulphide [3, 4, 5, 6]. Some substances, such as essential oils, $ZnCl_2$, chlorophyll or cetylpyridum chloride and other products, like two phase oil-water mounthwash containing olive oil, can reduce the *faetor ex ore* [8, 9] by decreasing volatile compounds in the breath [7].

Vegetable oils are mainly constituted by triacylglycerols and complex mixtures of minor compounds in a wide range of natural chemicals: fatty alcohols, wax esters, hydrocarbons, tocopherols and tocotrienols, phenolic compounds, volatiles, pigments, minor glyceridic compounds, phospholipids and triterpenic acids [10, 11]. Because of this mixed composition, seed oils can be used in the adjunct treatment in medicine.

Some commercial seed oils were examined to determine the presence of chlorophyll, tocopherols and β-carotene. The oils can be natural sources of these compounds and the analysis was aimed to assess their possible application as mouthwashes in the treatment of *halitosis* and *stomatitis protetica*.

MATERIAL AND METHODS

Eight commercial seed oils obtained by squeezing were analysed: rape seed oil from *Brassica napus* L. var. *oleifera*; flaxseed oil from *Linum usitatissimum* L.; sunflower oil from *Helianthus annus* L.; soybean oil from *Glycine hispida* Moench.; corn oil from *Zea mays* L.; pumpkin seed oil from *Cucurbita pepo* L.; grape seed oil from *Vitis vinifera* L., and peanut oil from *Arachis hypogea* L.

Chlorophyll and β-carotene

Cyclohexane was the analytical UV reagent (Merck, Darmstadt, Germany), while β-carotene (95% purity, Sigma-Aldrich, Steinheim, Germany) and chlorophyll pastes oil (Extrasynthèse, Genay, France) were the analytical standards. The chlorophyll pastes oil was used as it is the only substance cyclohexane-soluble.

Sample preparation

Solutions of 5% of oils in cyclohexane were prepared and absorbances at two different wavelengths were measured (464 nm for β-carotene, and 669 nm for chlorophyll).

Standard preparation

Chlorophyll and β-carotene stock standard cyclohexane solutions were prepared at the appropriate dilutions.

Instrumental analysis

A UV-visible Varian series Cary 50 spectrophotometer was used.

Vitamin E (δ-, γ- ,α-tocopherols)

Chloroform, methanol and acetonitrile were the analytical reagents (Merck), while δ-, γ- and α-tocopherols were the analytical standards (Sigma-Aldrich).

Sample preparation

200 μl of chloroform and 790 μl of a acetonitrile/methanol mixture (50:50 v/v) were added to 10 mg of oil in a 1.8 ml vial.

Standard preparation

The δ-, γ- and α-tocopherols stock standard solution was prepared, while the working solutions were prepared for appropriate dilution with the eluent mixture.

Instrumental analysis

A 7000 series HPLC Merck Hitachi connected to an L-7485 series fluorescence detector was used. The operating conditions of the fluorescence detector were as follows: 290 nm, 330 nm. Methanol:acetonitrile (50/50, v/v) as eluent mixture was used, a flow rate of 1 ml/min. The column used was a Waters ODS2 (250 x 4.6 mm, 0.5 μm). All the statistical analyses were performed using the Statistica 6.1 program (StatSoft, Poland).

RESULTS AND DISCUSSION

Table 1 shows the presence of chlorophyll and β-carotene in the analysed seed oils measured by the spectrophotometer. Table 2 shows the amounts of δ-, γ- and α-tocopherols in the examined materials, as established by HPLC chromatography.

The chlorophyll concentration is extremely variable, ranging from a minimum of 29.1 mg/l in peanut oil to a maximum of 614.8 mg/l in pumpkin oil. A high tenor can also be found in soybean, rapeseed and grape oils. In sunflower, corn and flaxseed oils the amounts of chlorophyll were at a medium level. The amounts

Table 1

Amount of chlorophyll and β-carotene in examined seed oils.

oil	chlorophyll (mg/l)			β-carotene (mg/l)		
	mean*	±sd	CV	mean*	±sd	CV
rapeseed	188.3	6.5	3.4	34.3	1.0	2.8
sunflower	46.7	1.0	2.1	1.5	0.1	5.4
corn	97.2	4.2	4.3	18.3	0.6	3.4
pumpkin	614.8	6.3	1.0	109.8	3.1	2.8
flaxseed	67.6	4.4	6.5	14.1	1.1	8.0
peanut	29.1	2.1	7.1	0.1	0.0	5.3
soybean	238.9	5.1	2.2	5.6	0.4	7.8
grape	168.1	5.1	3.0	3.5	0.2	6.7

* means ± standard deviation of three determinations

Table 2

Amounts of δ-, γ- and α-tocopherols in examined seed oils.

oil	δ-tocopherol (mg/l)			γ-tocopherol (mg/l)			α-tocopherol (mg/l)			sum of
	mean*	±sd	CV	mean*	±sd	CV	mean*	±sd	CV	tocopherols
rapeseed	5.4	0.3	5.4	499.4	10.8	2.2	83.5	4.9	5.9	588.3
sunflower	9.5	0.2	2.1	137.5	9.4	6.8	497.0	19.8	4.0	644.0
corn	47.8	2.4	5.1	1677.3	31.3	1.9	50.9	3.6	7.1	1776.0
pumpkin	13.3	0.6	4.9	417.7	9.9	2.4	69.7	4.8	6.9	500.7
flaxseed	3.7	0.3	6.9	560.7	9.6	1.7	0.1	0.0	9.1	564.5
peanut	11.2	0.3	2.2	211.9	7.8	3.7	62.9	3.5	5.6	286.0
soybean	253.3	9.8	3.9	1375.9	28.1	2.0	88.2	5.4	6.1	1717.4
grape	0.1	0.0	5.6	3.0	0.2	7.8	136.4	9.9	7.3	139.5

* means ± standard deviation of three determinations

of β-carotene are similar, as pumpkin oil contains 109.8 mg/l, while peanut and sunflower oils have the lowest amounts of all. Rapeseed, corn and flaxseed oils showed a medium concentration of β-carotene. Pumpkin oil contains the highest amount of chlorophyll (614.8 mg/l) and β-carotene (109.8 mg/l) in the whole group of the examined oils.

The total amount of tocopherols is very high in corn and soybean seed oils (1776.0 mg/l and 1717.4 mg/l, respectively). Sunflower oil has the third highest amount of total tocopherols (644.0 mg/l). The smallest amount of tocopherols was observed in grape and peanut oils. Rapeseed oil contains almost half the amount of tocopherols in total detected in corn oil. Pumpkin and flaxseed oils have similar concetrations of tocopherols. All the seed oils show a preponderance of γ-tocopherol (more than 70%), except for grape and sunflower oils, where α-tocopherol is predominant (97.7 and 77.2%, respectively).

CONCLUSIONS

In the whole group of the examined oils, pumpkin oil, which shows the highest amount of chlorophyll (614.8 mg/l) and β-carotene (109.8 mg/l) could be the best as a gargle in the adjunct treatment of *stomatitis protetica* and *halitosis*. Soybean seed oil also contains large amounts of chlorophyll (238.9 mg/l) and tocopherols (1717.4 mg/l). Corn oil is the richest in tocopherols (1776.0 mg/l), but the chlorophyll content is rather low (97.2 mg/l).

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MOŻLIWOŚĆ WYKORZYSTANIA NIEKTÓRYCH OLEJÓW ROŚLINNYCH W LECZENIU *STOMATITIS PROTETICA* I *HALITOSIS*

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Streszczenie

Celem podjętej analizy niektórych olejów roślinnych było określenie zawartości związków naturalnych, które mogłyby być pomocne w leczeniu *stomatitis protetica* i *halitosis*. Osiem olejów roślinnych przebadano spektrofotometrycznie oraz za pomocą HPLC, by oznaczyć zawartość chlorofilu, β-karotenu i tokoferoli. Z wszystkich olejów olej z pestek dyni odznaczał się największą zawartością chlorofilu i β-karotenu oraz średnią zawartością sumy tokoferoli.

Słowa kluczowe: oleje roślinne, stomatitis protetica, halitosis