

Prof. Dr. **Samo Kreft**, mag. farm.

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Univerza na Primorskem

## **Potencial bioaktivnih in prehransko zanimivih snovi v ajdi in proizvodih iz ajde**

TRAFOON delavnica „Ajda med tradicijo in inovacijo“  
Maribor, junij 2015

### **zanimive snovi v ajdi:**

- **Proteini z ugodno aminokislinsko sestavo**
- **Škrob z ugodno počasno razgradnjo**
- **Lipidi z ugodno maščobno kislinsko sestavo**
- **Minerali**
- **Vitamini**
- **Vlaknine**
- **Antioksidanti**
- **Aromatične snovi**
- **Fototoksični fagopirini**

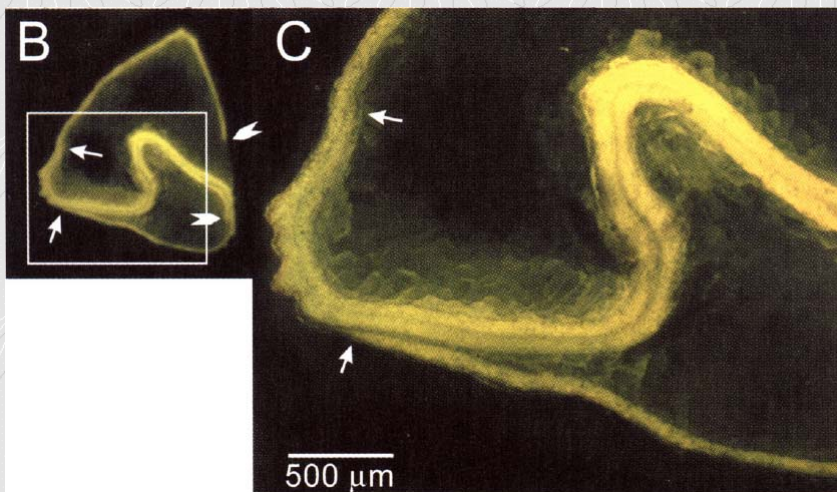


## Antioksidanti – polifenoli - rutin



KREFT, Samo, ŠTRUKELJ, Borut, GABERŠČIK, Alenka, KREFT, Ivan. Rutin in buckwheat herbs grown at different UV-B radiation levels: comparison of two UV spectrophotometric and an HPLC method. *Journal of Experimental Botany*, 2002, 53, 1801-1804.

## Antioksidanti – polifenoli - rutin



KREFT, Marko, KREFT, Samo (1999a). Computer aided three-dimensional reconstruction of the buckwheat (*Fagopyrum esculentum* Moench) seed morphology. *Zbornik Biotehniške fakultete Univerze v Ljubljani, Kmetijstvo, Agricultural issue*, 73, 331-336.

**Aroma**

O=Cc1ccccc1O

NMR, IR, MS

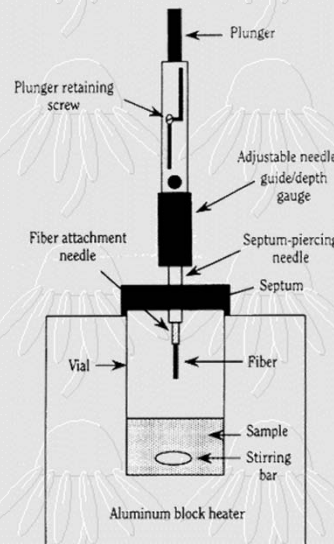
JANEŠ, Damjan, KREFT, Samo. **Salicylaldehyde** is a characteristic aroma component of buckwheat groats. Food chemistry, 2008, vol. 109, no. 2, str. 293-298.

Snov odgovorna za aromo ovsenih kosmičev:  
 (E,E,Z)-2,4,6-nonatrienal, 13 mikro g/kg ovsenih kosmičev,

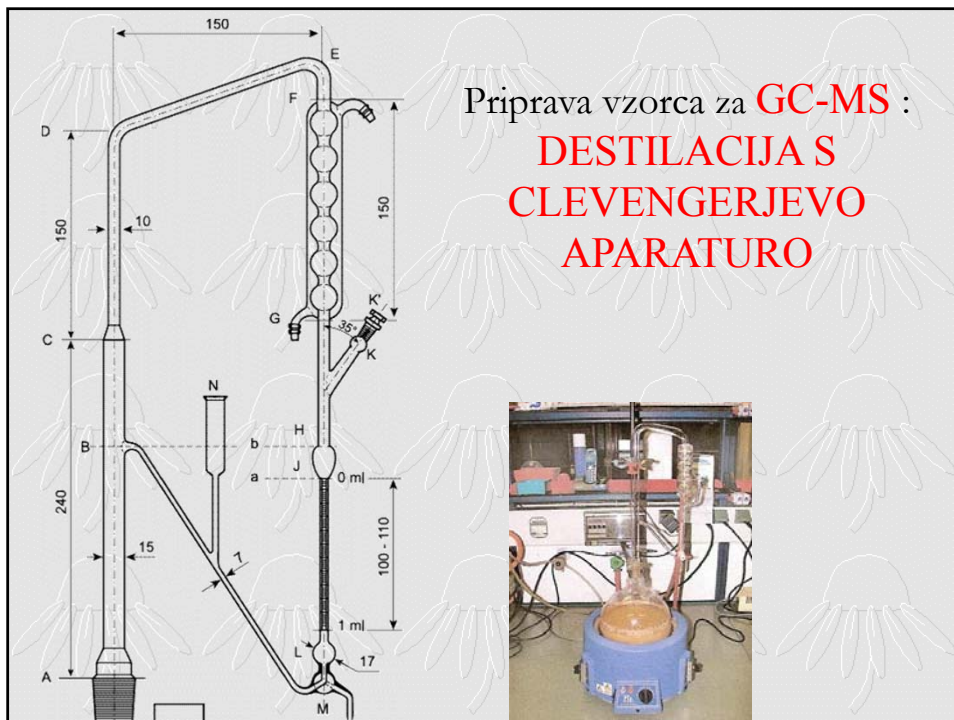
CCCC=CC=CC=CC=O

Schuh C, Schieberle P. Characterization of (E,E,Z)-2,4,6-nonatrienal as a character impact aroma compound of oat flakes. J Agric Food Chem. 2005; 53(22): 8699-8705.

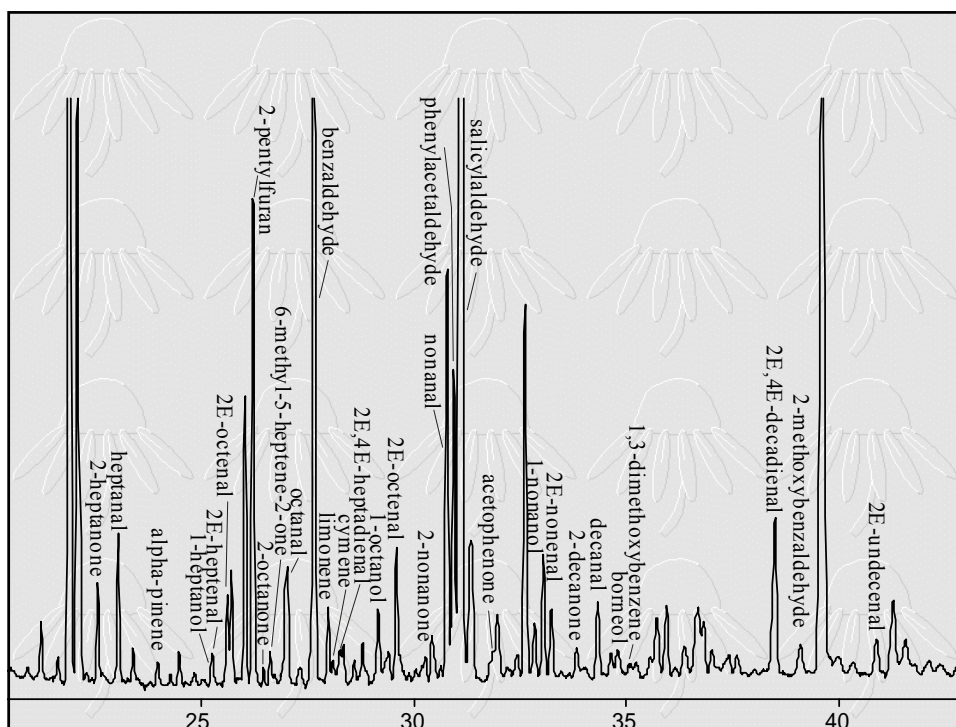
Prilava vzorca za **GC-MS**:  
**ADSORPCIJSKE TEHNIKE**



Prilava vzorca za **GC-MS** :  
**DESTILACIJA S**  
**CLEVENGERJEVO**  
**APARATURO**





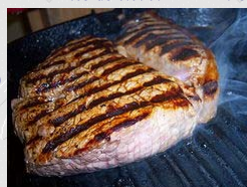


### Za vonj pomembne spojine iz ajdove kaše (iz toluenskega destilata)

spojina	koncentracija v kaši [ppb]	OTV [ppb v vodi]	OAV	ACD/Log P
( <i>E,E</i> )-2,4-decadienal	316.6	0.07 do 10	4523 do 31.7	3.18
( <i>E</i> )-2-nonenal	24.17	0.1	242	3.17
decanal	11.69	0.1 to 5	117 do 2.34	4.09
hexanal	375.9	4.1 to 22.8	91.7 do 16.5	1.97
salicylaldehyde	2246	30	74.9	1.61
nonanal	58.31	1 do 8	58.3 do 7.29	3.56
octanal	22.14	0.7 do 6.4	31.6 do 3.46	3.03
2-pentylfuran	149.9	6	25.0	3.97
phenylacetaldehyde	54.52	4	13.6	1.78
2-heptanone	10.38	1 do 1330	10.4 do $7.80 \times 10^3$	1.97
heptanal	30.46	3 do 60	10.2 do 0.508	2.50
( <i>E</i> )-2-octenal	28.75	3 do 4	9.58 do 7.19	2.64
limonene	16.19	4 do 229	4.05 do 0.0707	4.45
1-heptanol*	9.628	3	3.21	2.47
( <i>E</i> )-2-octenol*	11.56	4 do 14	2.89 do 0.826	2.64
benzaldehyde	168.7	100 do 4600	1.69 do 0.0367	1.64
alpha-pinene	3.512	2.5 do 62	1.41 do 0.0566	4.37
( <i>E</i> )-2-heptenal	13.19	13 do 51	1.01 do 0.259	2.11

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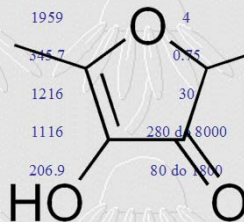
### Za vonj pomembne spojine iz ajdove kaše (iz metanolnega izvlečka)

spojina	koncentracija v kaši [ppb]	OTV [ppb v vodi]	OAV	izkoristek po destilaciji [%]	ACD/Log P
2,5-dimethyl-4-hydroxy-3(2H)-furanone*	6238	0.03 do 60	$2.08 \times 10^5$ to 104	0	0.34
phenylacetaldehyde	1959	4	490	-	1.78
2-methoxy-4-vinylphenol	345.7	0.75	461	0	1.93
salicylaldehyde	1216	30	40.5	-	1.61
furfural*	1116	280 do 8000	3.98 do 0.139	0	0.73
2,5-dimethylpyrazine*	206.9	80 do 1800	2.59 do 0.115	2.4	0.64



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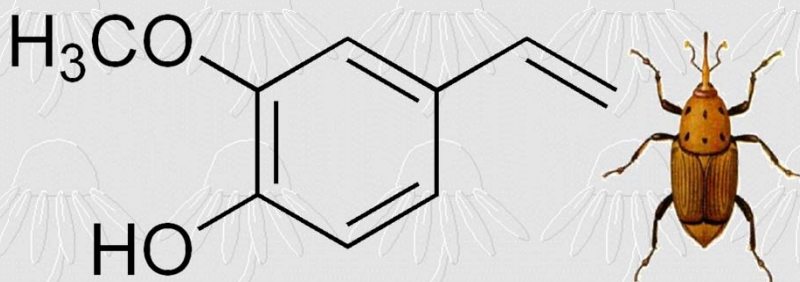
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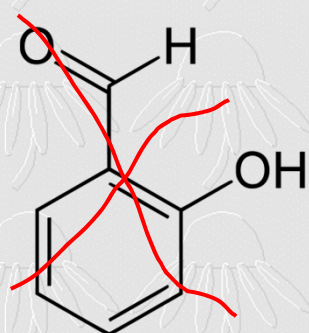
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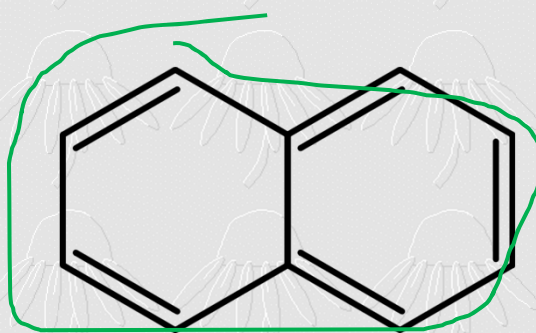


Za vonj pomembne spojine iz tatarske ajde

26 snovi z „odor activity value“ (OAV) nad 10















salicilaldehyd

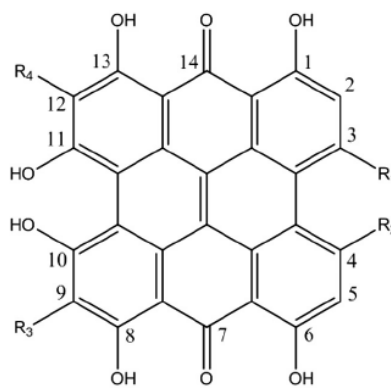


naftalen

JANEŠ, Damjan, PROSEN, Helena, KREFT, Samo. Identification and quantification of aroma compounds of tartary buckwheat (*Fagopyrum tataricum* Gaertn.) and some of its milling fractions. *Journal of food science*, 2012, vol. 7, no. 7, str. C746-C751

## Fototoksični fagopirini

	R1	R2	R3	R4
Fagopyrin A	CH <sub>3</sub>	CH <sub>3</sub>		
Fagopyrin B	H	H		
Fagopyrin C	CH <sub>3</sub>	H		
Fagopyrin D	CH <sub>3</sub>	H		
Fagopyrin E	CH <sub>3</sub>	CH <sub>3</sub>		
Fagopyrin F	CH <sub>3</sub>	CH <sub>3</sub>		



TAVČAR BENKOVIĆ, Eva, ŽIGON, Dušan, FRIEDRICH, Miha, PLAVEC, Janez, KREFT, Samo. Isolation, analysis and structures of phototoxic fagopyrins from buckwheat. *Food chemistry*, 143, 2014, 432-439.

## Fototoksični fagopirini

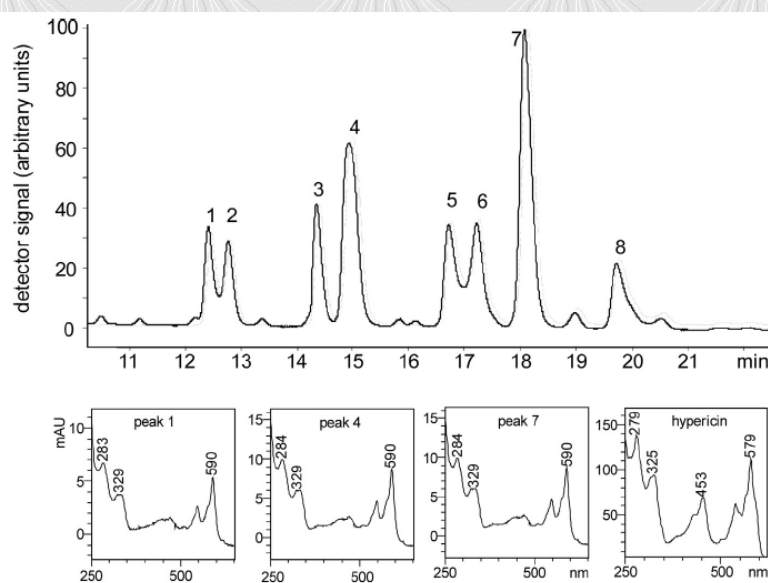
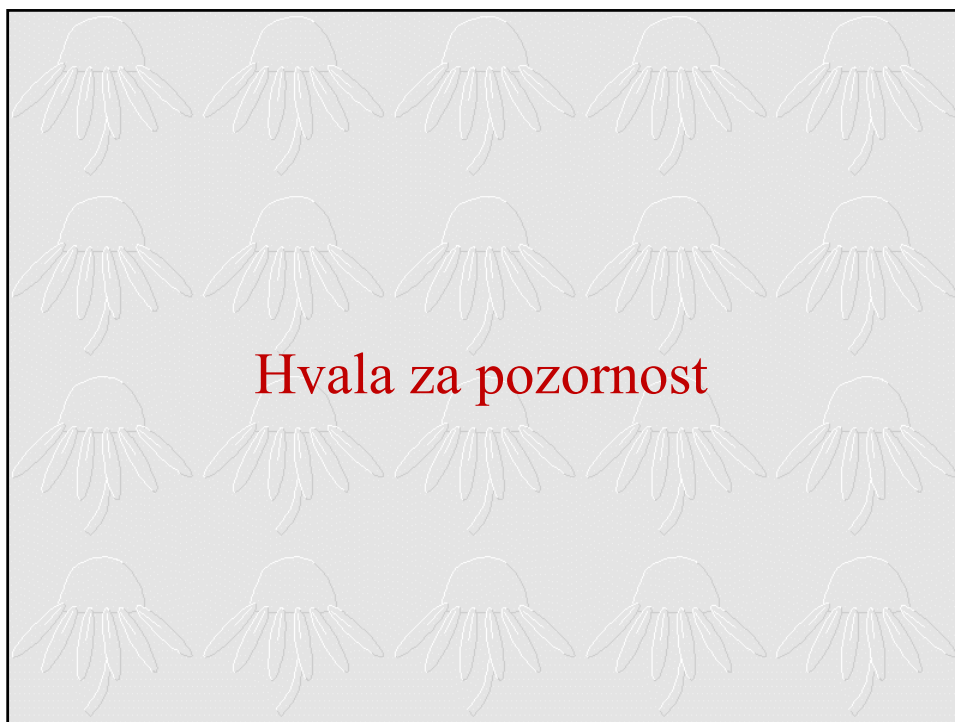


Fig. 1. Chromatogram of the HPLC separation of a buckwheat sample, photodiode array detection at 590 nm and fluorescence detection gained similar results (Top). Absorption spectra of peaks 1, 4, 7 and hypericin, obtained from an HPLC chromatogram (bottom).



**Trafoon Workshop: „Ajda med tradicijo in inovacijo / Buckwheat between tradition and innovation“**

3. – 4. June, 2015

Maribor, Slovenia

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