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EXTRACTION AND STUDY OF THE BIOLOGICAL ACTIVITY OF FLAVANOIDS FROM ALTAY REGION SEA BUCKTHORN EXTRACTION CAKE

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СДЕЛАНО В РОССИИ

(1949 – 2024)












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СДЕЛАНО В РОССИИ

Export

-Azerbaijan
-Armenia
-Belarus
-Georgia
-Kazakhstan
-Kyrgyzstan

-Mongolia
-Romania
-Turkmenistan
-Turkey
-Uzbekistan

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Seabuckthorn extraction cake composition

Component	Content, %
Protein	24,60–24,80
Fiber	17,50–21,50
Hemicellulose	10,30-12,40
Total sugars	2,30–2,50
Pectins, including soluble	1,50–1,60
Flavonoids	**2,70–4,10**
Tannins	0,82–0,84
Organic acids	2,70–4,65
Ash	2,60–3,70
Moisture	3,50–7,00

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The aim of the study:

-Development of the intensive technologies of flavonoid extraction from seabuckthorn extraction cake;

-Examination of the biological activity of the excreted compounds.

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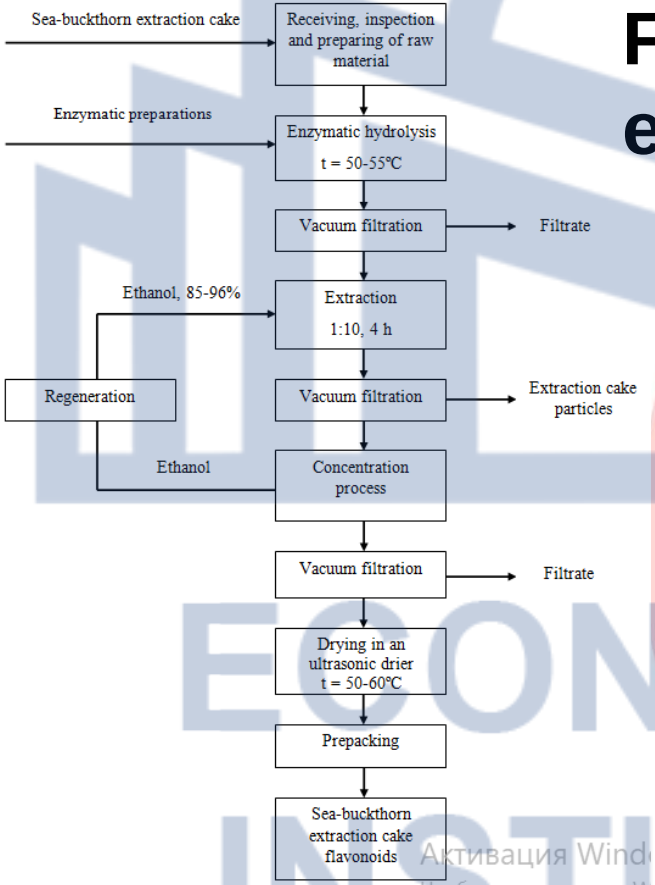
Flow chart of seabuckthorn extraction cake flavonoids



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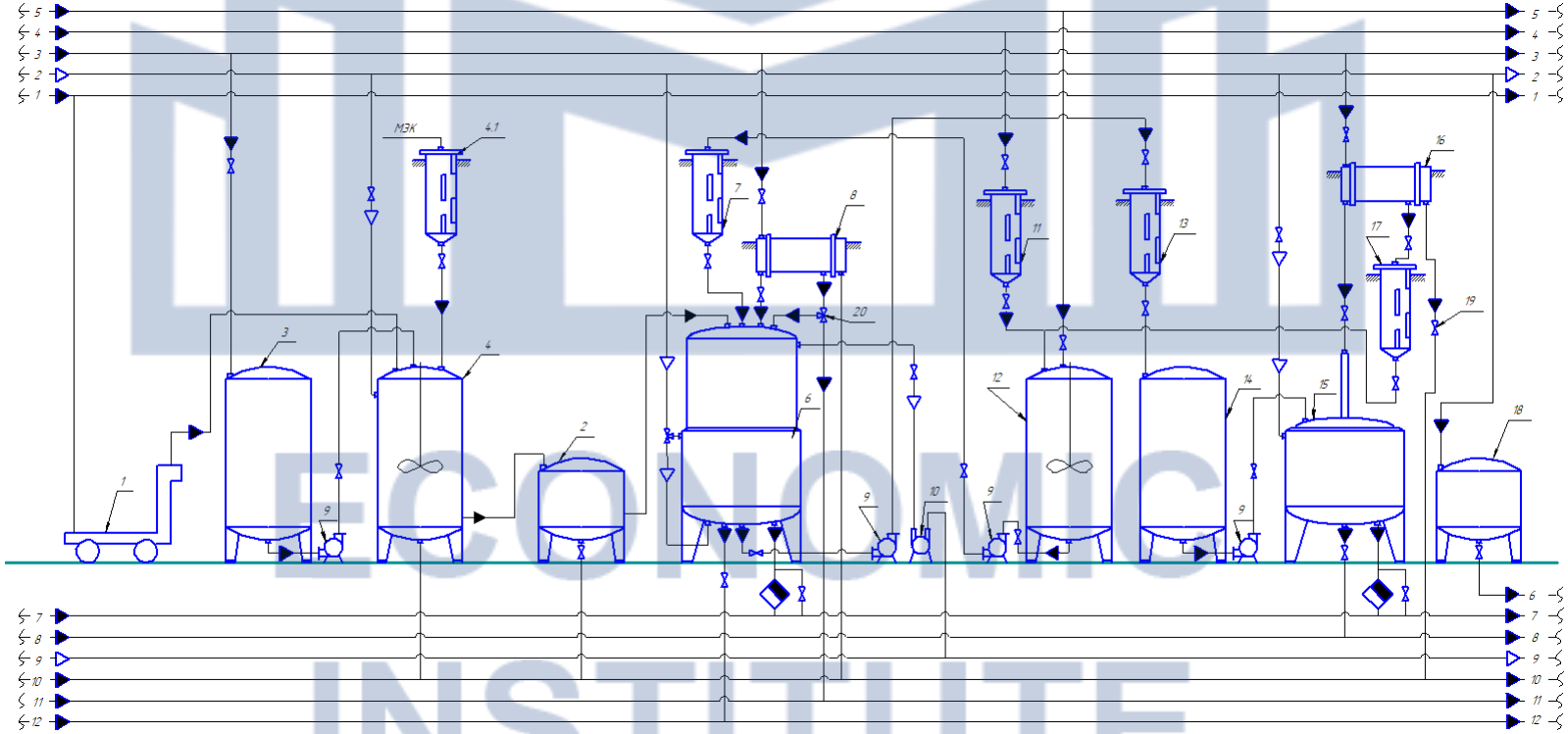
Process flow-diagram of obtaining flavonoids from seabuckthorn extraction cake



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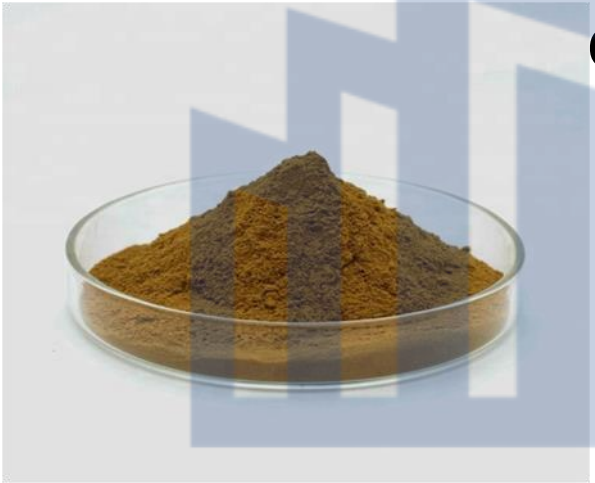
Quality parameters of seabuckthorn extraction cake flavonoids



Parameter	Characteristics
Appearance	Yellow-brown powder
Flavour	Neutral, slightly sour
Odour	Low, characteristic to seabuckthorn berries
Flavonoids, %	**92,0**
Including rutin, %	17,8
Moisture, %	5,5
Ash weight, %	0,2
Impurities (mineral, organic)	Absent

Parameter	QMA& OAMO CFU/1 g	Yeasts CFU/g,	Molds CFU/g	Coliform bacteria not allowed in product weight, in g
Standard, NMT	$5{,}0 \cdot 10^4$	200	100	0,1
Result	<15	<15	na	na

Safety parameter	Standard, mg/kg, NMT	Result
Lead, Pb	5,0	0,14±0,01
Arsenic, As	0,5	0,05±0,01
Cadmium, Cd	1,0	0,11±0,01
Mercury, Hg	0,1	<0,05
HCH pesticides (α, β, γ - isomers)	0,05	Less than 0,01

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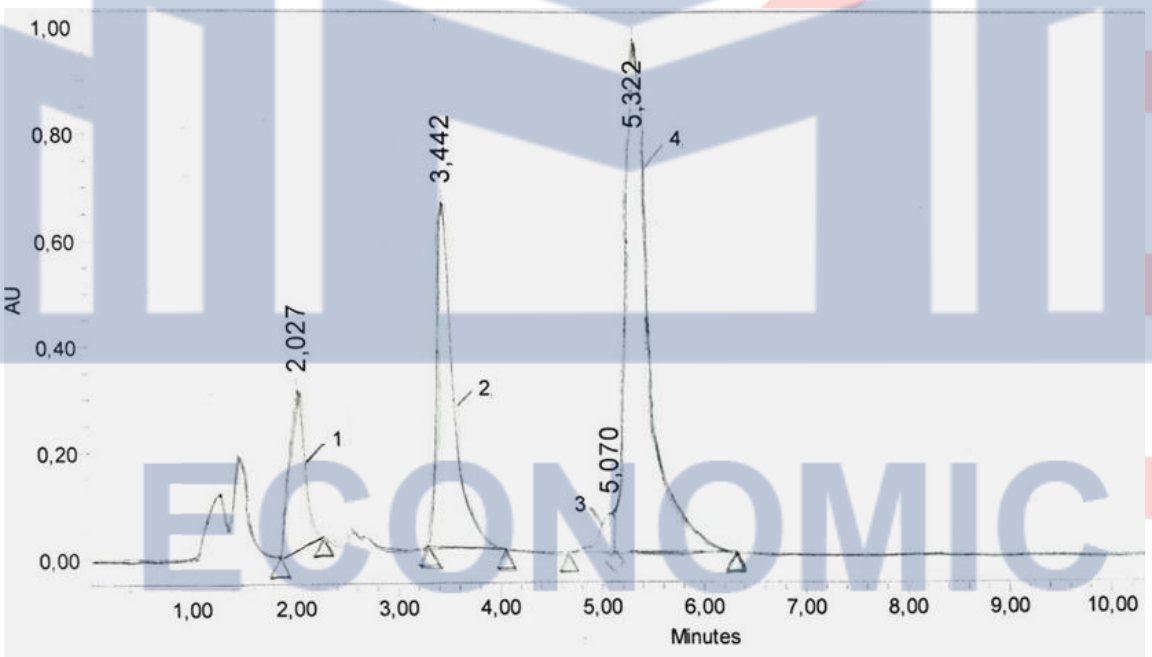
Seabuckthorn extraction cake flavonoids composition by HPLC method



1 – rutin; 2 – quercetin; 3 – kaempferol; 4 – isorhamnetin

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Examples of pharmaceuticals and dietary supplements with individual flavonoids

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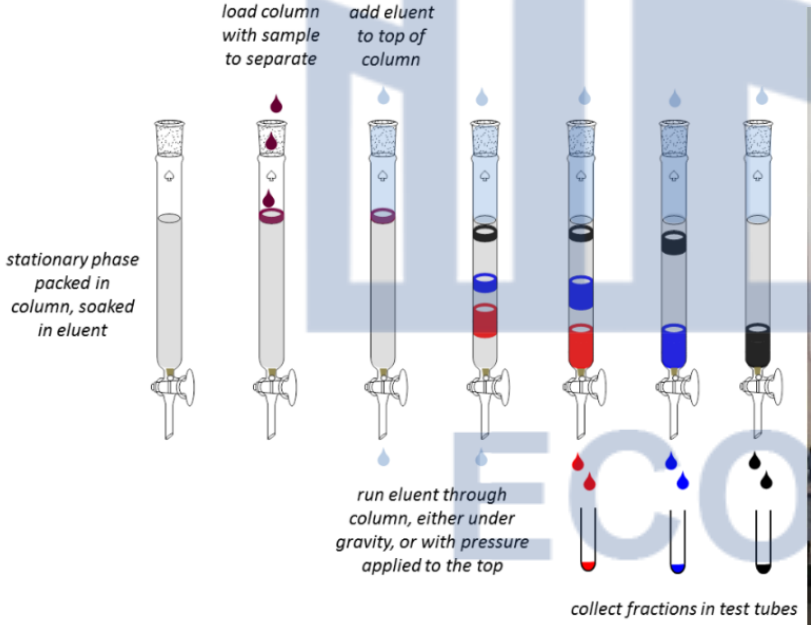
Flavonoid separation by absorption column chromatography



0 min 10 min 35 min 50 min 65 min 80 min 120 min 240 min

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Seabuckthorn extraction cake flavonols composition by HPLC method

Flavonols found in the purified fraction were: quercetin– 29%, kaempferol– 2% и **isorhamnetin – 68 %.**

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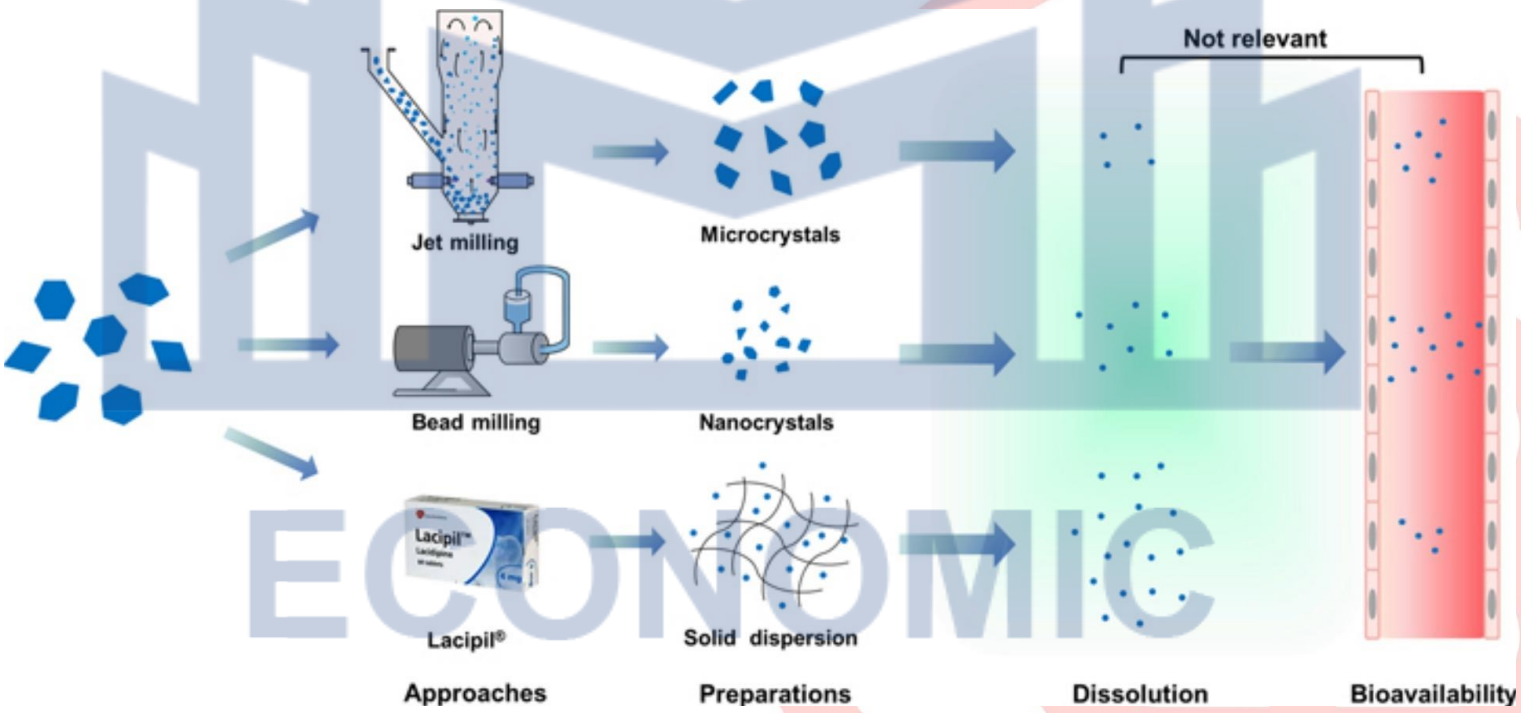
Micronization



https://doi.org/10.1016/j.colsurfb.2015.05.010

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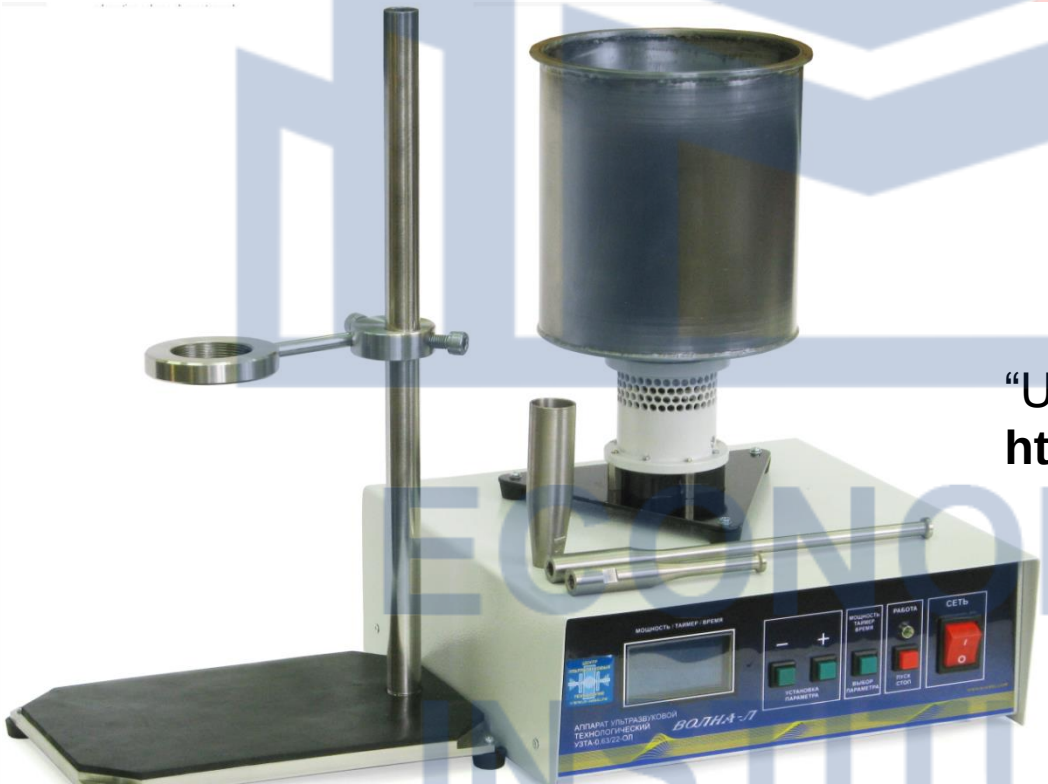
Ultrasonic micronization



“Ultrasonic Technologies Center”LLC,
http://u-sonic.ru/ vnh@bti.secna.ru

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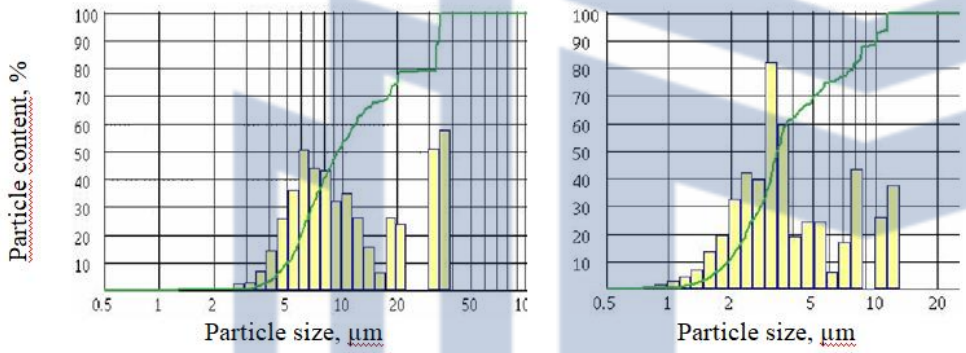
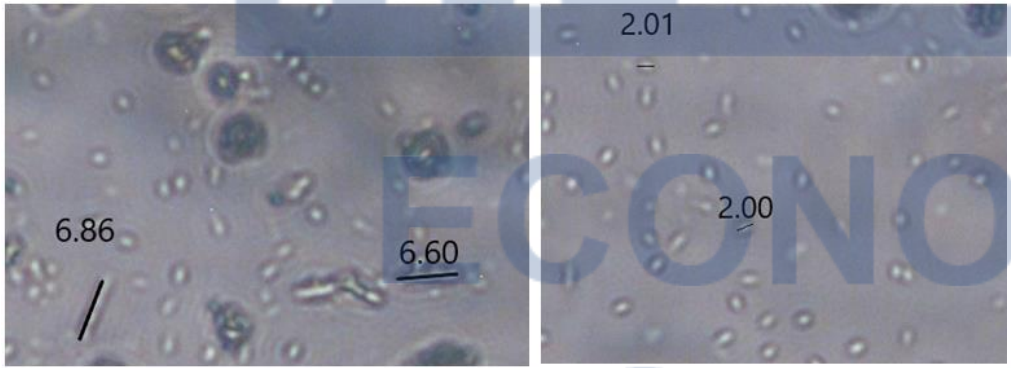
Micronized seabuckthorn extraction cake flavonols





а – before micronization

б – after micronization

Content by HPLC:
isorhamnetin 64,2 %,
quercetin 34,3 %,

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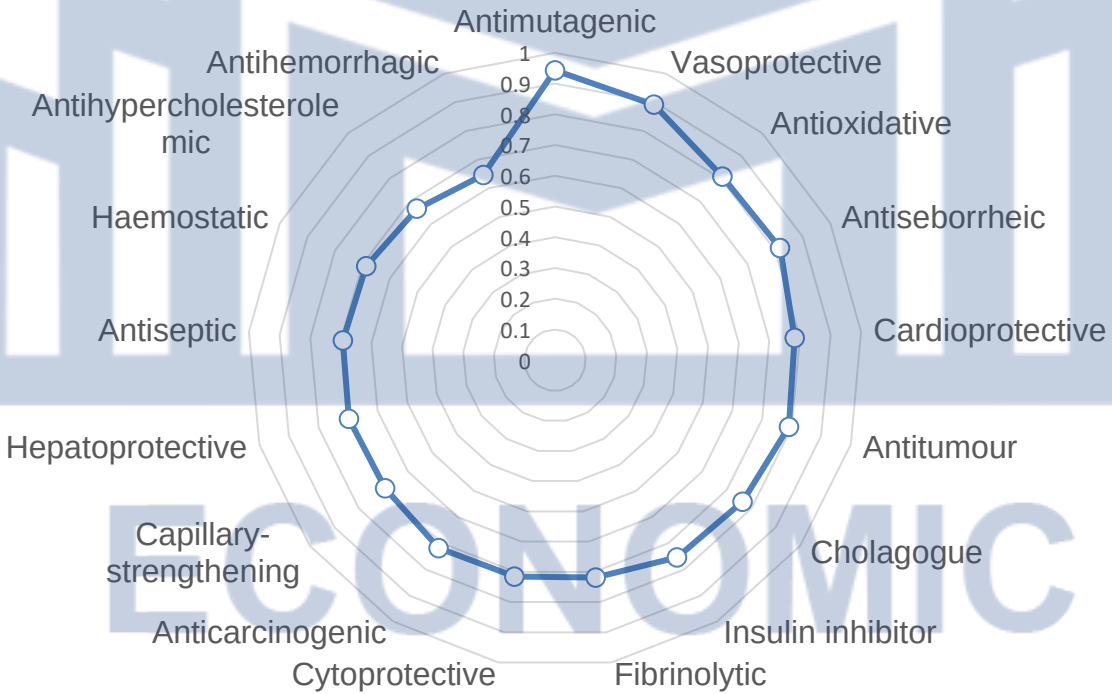
Isorhamnetin biological activity prediction



PASS Online, Institute of Biomedical Chemistry, Moscow. https://www.way2drug.com/passonline/index.php

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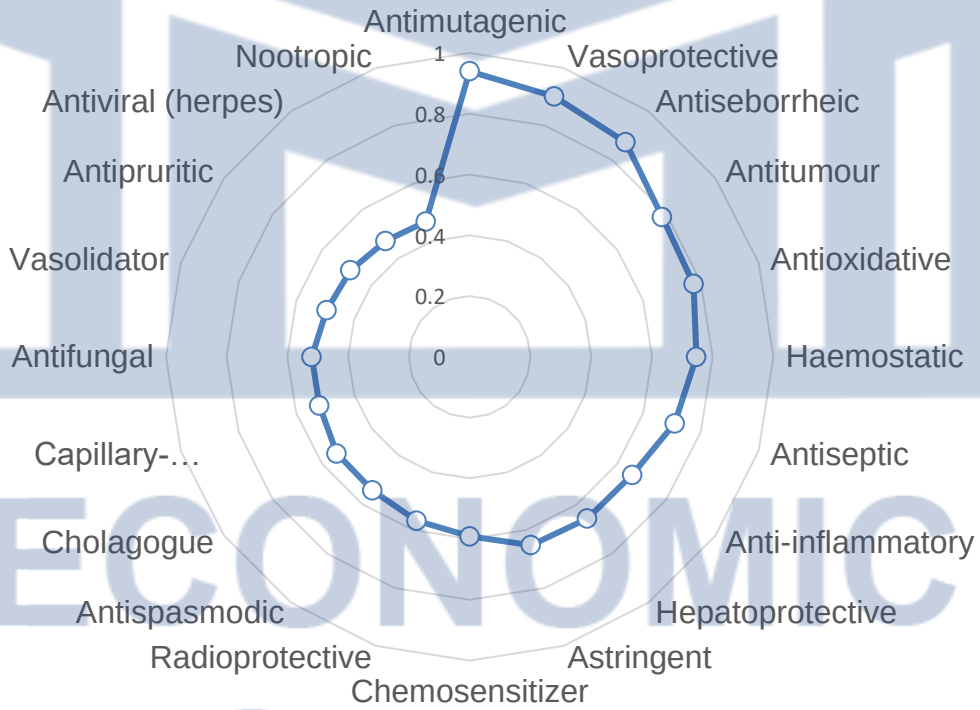
Quercetin biological activity prediction



PASS Online, Institute of Biomedical Chemistry, Moscow. https://www.way2drug.com/passonline/index.php

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Micronized flavonol samples antimicrobial activity

Strains	Before micronization, μg/cm^3	After micronization, μg/cm^3
Escherichia coli ATCC 25922	3000	3000
Staphylococcus aureus ATCC 6538 (209-P)	2000	2000
***Pseudomonas aeruginosa* ATCC 9027**	**3000**	**2000**
Yeast-like fungi: *Candida albicans* ATCC 10231	1000	1000

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Seabuckthorn flavonol samples antioxidant activity

Parameter	Without flavonoids	Before micronization	After micronization
AOA, mg/g	0	0,125	0,500
GR reaction rate: - µmol/(min per mg of protein) - %	2,92±0,06 100	4,41±0,10 151*	4,35±0,21 144*
CAT reaction rate: - µmol/(min per mg of protein) - %	1,50±0,02 100	1,56±0,02 104	1,85±0,09 123*

* - the values are true at $p<0,05$

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Rat blood oxidant and antioxidant status values

Sample	TOS, %	TBRP*, μm	CAT, %	SOD, %	TAS, %
Control (water)	48,7	2,8	22,4	28,3	86,2
Rutin	32,1	2,1	11,2	22,9	82,8
Seabuckthorn extraction cake micronized flavonols	28,0	2,3	2,6	22,8	84,1

* Thiobarbiturate-sensitive products

In *in vivo* experiments in male Wistar rats, a maximum dose of micronized seabuckthorn extraction cake flavonols administration was not more than 25 mg/kg of body weight.

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Conclusion

1. A high performance technology of seabuckthorn extraction cake flavonoid extraction with 4% yield was developed.
2. The possibility of extraction and micronization of seabuckthorn extraction cake flavonols, the main components of which are isorhamnetin and quercetin, was studied.
3. The studies performed prove the possibility of using seabuckthorn extraction cake flavonols as active ingredients for dietary supplement manufacturing with antioxidant and anti-inflammatory activity.

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**We help to protect health –
the only supreme value!**

Thank you for attention

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