

# Rutin

**Rutin**, also called **rutoside**, **quercetin-3-O-rutinoside** and **sophorin**, is the glycoside combining the flavonol quercetin and the disaccharide rutinose ( $\alpha$ -L-rhamnopyranosyl-(1→6)- $\beta$ -D-glucopyranose). It is a flavonoid found in a wide variety of plants, including citrus.

## Occurrences

Rutin is one of the phenolic compounds found in the invasive plant species, *Carpobrotus edulis*. Its name comes from the name of *Ruta graveolens*, a plant that also contains rutin. Various citrus fruit peels contain 32 to 49 mg/g of flavonoids expressed as rutin equivalents.<sup>[3]</sup> Citrus leaves contain rutin at concentrations of 11 and 7 g/kg in orange and lime trees, respectively.<sup>[4]</sup> In 2021, Samoan researchers identified rutin in the native plant, *matalafi* (*Psychotria insularum*).<sup>[5]</sup>

## Metabolism

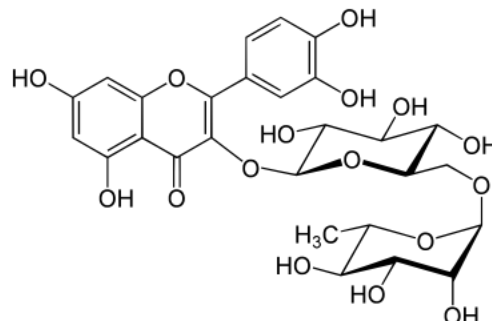
The enzyme quercitrinase found in *Aspergillus flavus* is in the rutin catabolic pathway.<sup>[6]</sup>

## In food

Rutin is a citrus flavonoid glycoside found in many plants, including buckwheat,<sup>[7]</sup> the leaves and petioles of *Rheum* species, and asparagus. Tartary buckwheat seeds have been found to contain more rutin (about 0.8–1.7% dry weight) than common buckwheat seeds (0.01% dry weight).<sup>[7]</sup> Rutin is one of the primary flavonols found in 'clingstone' peaches.<sup>[8]</sup> It is also found in green tea infusions.<sup>[9]</sup>

Approximate rutin content per 100g of selected foods, in milligrams per 100 milliliters.<sup>[10]</sup>

**Rutin**



**Names**

### IUPAC name

3',4',5,7-Tetrahydroxy-3-[ $\alpha$ -L-rhamnopyranosyl-(1→6)- $\beta$ -D-glucopyranosyloxy]flavone

### Preferred IUPAC name

(4<sup>2</sup>S,4<sup>3</sup>R,4<sup>4</sup>S,4<sup>5</sup>S,4<sup>6</sup>R,7<sup>2</sup>R,7<sup>3</sup>R,7<sup>4</sup>R,7<sup>5</sup>R,7<sup>6</sup>S)-1<sup>3</sup>,1<sup>4</sup>,2<sup>5</sup>,2<sup>7</sup>,4<sup>3</sup>,4<sup>4</sup>,4<sup>5</sup>,7<sup>3</sup>,7<sup>4</sup>,7<sup>5</sup>-Decahydroxy-7<sup>6</sup>-methyl-2<sup>4</sup>H-3,6-dioxa-2(2,3)-[1]benzopyrana-4(2,6),7(2)-bis(oxana)-1(1)-benzenaheptaphane-2<sup>4</sup>-one

### Other names

Rutoside (INN)  
Phytomelin  
Sophorin  
Birutan  
Eldrin  
Birutan Forte  
Rutin trihydrate  
Globularicitrin  
Violaquercitrin  
Quercetin rutinoside

### Identifiers

#### CAS Number

153-18-4 ([https://commonchemistry.cas.org/detail?cas\\_rn=153-18-4](https://commonchemistry.cas.org/detail?cas_rn=153-18-4))<sup>✓</sup>

#### 3D model (JSmol)

Interactive image (<https://chemapps.stolaf.edu/jmol/jmol.php?model=CC1C%28C%28C%28C%28O1%29OCC2C%28C%28C%28C%28O2%29OC3%3D>)

Sortable table

Numeric	Alphabetic
332	Capers, spice
45	Olive [Black], raw
36	Buckwheat, whole grain flour
23	Asparagus, raw
19	Black raspberry, raw
11	Red raspberry, raw
9	Buckwheat, groats, thermally treated
6	Buckwheat, refined flour
6	Greencurrant
6	Plum, fresh
5	Blackcurrant, raw
4	Blackberry, raw
3	Tomato (Cherry), whole, raw
2	Prune
2	Fenugreek
2	Marjoram, dried
2	Tea (Black), infusion
1	Grape, raisin
1	Zucchini, raw
1	Apricot, raw
1	Tea (Green), infusion
0	Apple
0	Redcurrant
0	Grape (green)
0	Tomato, whole, raw

## Research

Rutin (rutoside or rutinoideside)<sup>[11]</sup> and other dietary flavonols are under preliminary clinical research for their potential biological effects, such as in reducing post-thrombotic syndrome, venous insufficiency, or endothelial dysfunction, but there was no high-quality evidence for their safe and effective uses as of 2018.<sup>[11][12][13]</sup> A 2020 review


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<u>ChemSpider</u>	4444362 ( <a href="https://www.chemspider.com/Chemical-Structure.4444362.html">https://www.chemspider.com/Chemical-Structure.4444362.html</a> ) <span>✖</span>
<u>DrugBank</u>	DB01698 ( <a href="https://www.drugbank.ca/drugs/DB01698">https://www.drugbank.ca/drugs/DB01698</a> ) <span>✓</span>
<u>ECHA InfoCard</u>	100.005.287 ( <a href="https://echa.europa.eu/substance-information/-/substanceinfo/100.005.287">https://echa.europa.eu/substance-information/-/substanceinfo/100.005.287</a> )
<u>KEGG</u>	C05625 ( <a href="https://www.kegg.jp/entry/C05625">https://www.kegg.jp/entry/C05625</a> ) <span>✖</span>
<u>PubChem CID</u>	5280805 ( <a href="https://pubchem.ncbi.nlm.nih.gov/compound/5280805">https://pubchem.ncbi.nlm.nih.gov/compound/5280805</a> )
<u>RTECS number</u>	VM2975000
<u>UNII</u>	5G06TVY3R7 ( <a href="https://precision.fda.gov/uniisearch/srs/unii/5G06TVY3R7">https://precision.fda.gov/uniisearch/srs/unii/5G06TVY3R7</a> ) <span>✓</span>
<u>CompTox Dashboard (EPA)</u>	DTXSID3022326 ( <a href="https://comptox.epa.gov/dashboard/chemical/details/DTXSID3022326">https://comptox.epa.gov/dashboard/chemical/details/DTXSID3022326</a> )
<u>InChI</u>	<div>InChI=1S/C27H30O16/c1-8-17(32)20(35)22(37)26(40-8)39-7-15-18(33)21(36)23(38)27(42-15)43-25-19(34)16-13(31)5-10(28)6-14(16)41-24(25)9-2-3-11(29)12(30)4-9/h2-6,8,15,17-18,20-23,26-33,35-38H,7H2,1H3/t8-,15+,17-,18+,20+,21-,22+,23+,26+,27-/m0/s1</div>
<u>SMILES</u>	<div>CC1C(C(C(C(O1)OCC2C(C(C(C(O2)OC3=C(OC4=CC(=CC(=C4C3=O)O)O)C5=CC(=C(C=C5)O)O)O)O)O)O)O</div>
<b>Properties</b>	
<u>Chemical formula</u>	C <sub>27</sub> H <sub>30</sub> O <sub>16</sub>
<u>Molar mass</u>	610.521 g·mol <sup>−1</sup>
<u>Appearance</u>	Solid
<u>Melting point</u>	242 °C (468 °F; 515 K)

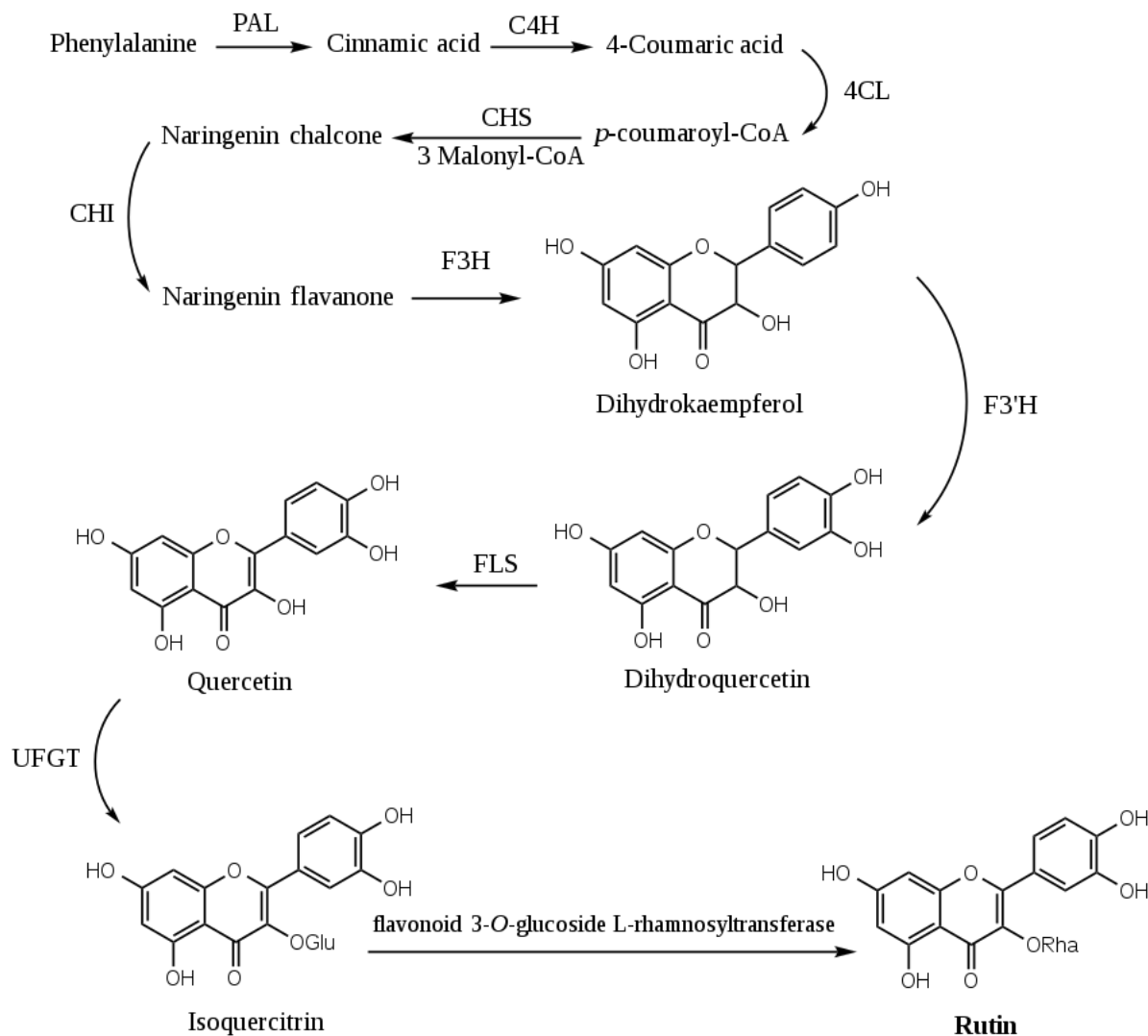
indicated that oral rutosides may reduce leg edema in people with post-thrombotic syndrome, but the risk of adverse effects was higher.<sup>[14]</sup>

As a flavonol among similar flavonoids, rutin has low bioavailability due to poor absorption, high metabolism, and rapid excretion that collectively make its potential for use as a therapeutic agent limited.<sup>[11]</sup>

## Biosynthesis

The biosynthesis pathway of rutin in mulberry (*Morus alba* L.) leaves begins with phenylalanine, which produces cinnamic acid under the action of phenylalanine ammonia lyase (PAL). Cinnamic acid is catalyzed by cinnamic acid-4-hydroxylase (C4H) and 4-coumarate-CoA ligase (4CL) to form p-coumaroyl-CoA. Subsequently, chalcone synthase (CHS) catalyzes the condensation of p-coumaroyl-CoA and three molecules of malonyl-CoA to produce naringenin chalcone, which is eventually converted into naringenin flavanone with the participation of chalcone isomerase (CHI). With the action of flavanone 3-hydroxylase (F3H), dihydrokaempferol (DHK) is generated. DHK can be further hydroxylated by flavonoid 3'-hydroxylase (F3'H) to produce dihydroquercetin (DHQ), which is then catalyzed by flavonol synthase (FLS) to form quercetin. After quercetin is catalyzed by UDP-glucose flavonoid 3-O-glucosyltransferase (UFGT) to form isoquercitrin, finally, the formation of rutin from isoquercitrin is catalyzed by flavonoid 3-O-glucoside L-rhamnosyltransferase.<sup>[15]</sup>

<u>Solubility in water</u>	12.5 mg/100 mL <sup>[1]</sup> 13 mg/100mL <sup>[2]</sup>
<b>Pharmacology</b>	
<u>ATC code</u>	C05CA01 (WHO ( <a href="https://www.whooc.no/atc_ddd_index/?code=C05CA01">https://www.whooc.no/atc_ddd_index/?code=C05CA01</a> ))
<b>Hazards</b>	
<b>NFPA 704</b> (fire diamond)	
<p>Except where otherwise noted, data are given for materials in their <u>standard state</u> (at 25 °C [77 °F], 100 kPa).</p> <p style="text-align: center;"><span style="color: red;">✗</span> <u>verify</u> (what is <span style="color: green;">✓✗</span>?)</p> <p style="text-align: center;"><u>Infobox references</u></p>	



## References

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