



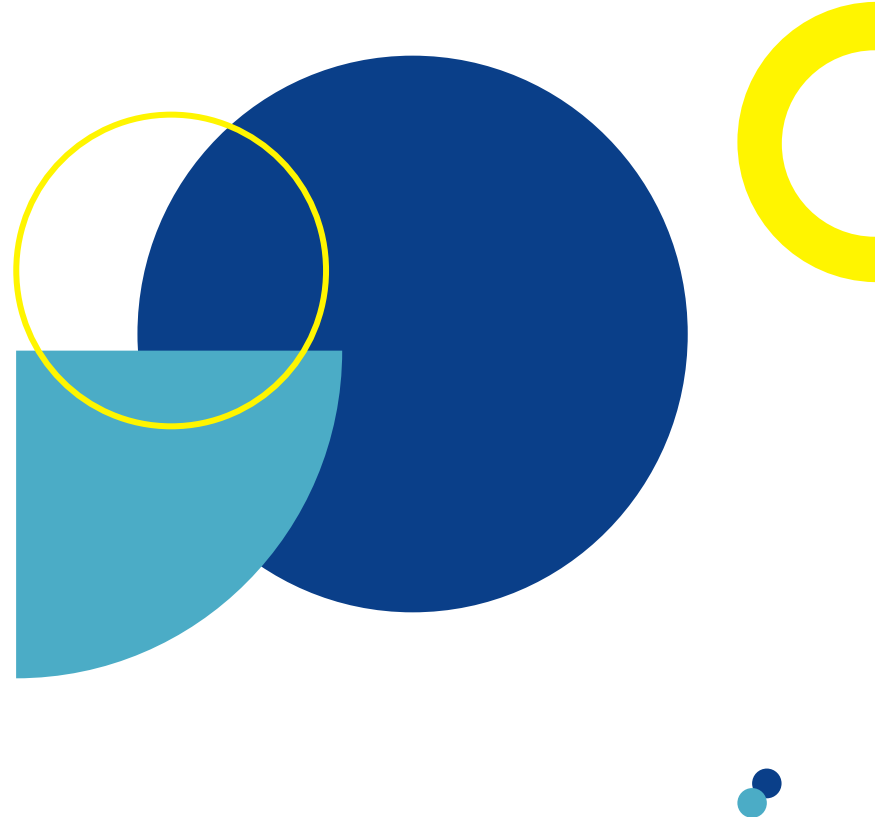
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FLAVONOID

Tim Penyusun

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PUSTAKA

Evans WC. Trease and Evans' Pharmacognosy. 16th Ed. London: Saunders Elsevier; 2009.

Heinrich M *et al.* 2010. Farmakognosi dan Fitoterapi. Jakarta. Penerbit Buku Ke dokteran: EGC.

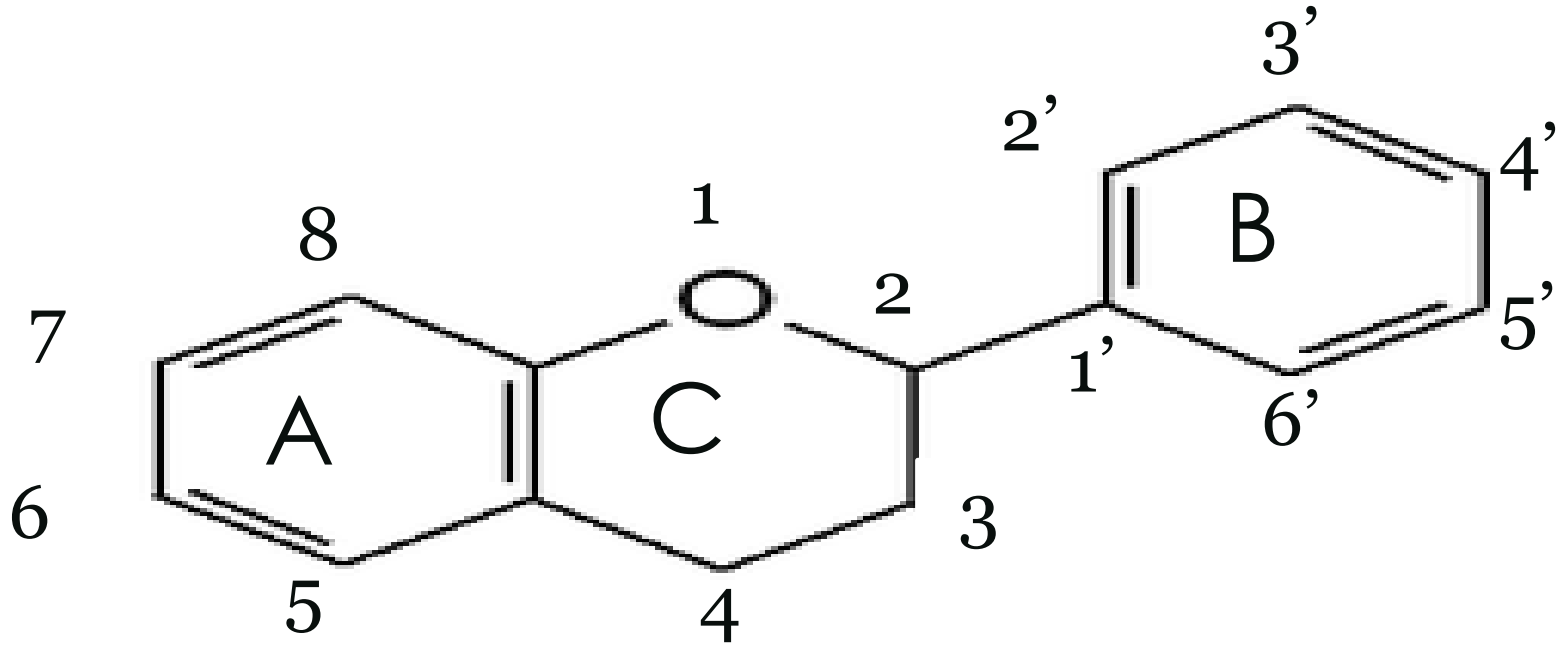


PENGERTIAN FLAVONOID

Flavonoid adalah senyawa yang terdiri dari 15 atom karbon yang umumnya tersebar di dunia tumbuhan. Lebih dari 2000 flavonoid yang berasal dari tumbuhan telah diidentifikasi.

Dan merupakan salah satu golongan fenol alam yang terbesar, dan terdapat dalam seluruh tumbuhan hijau.

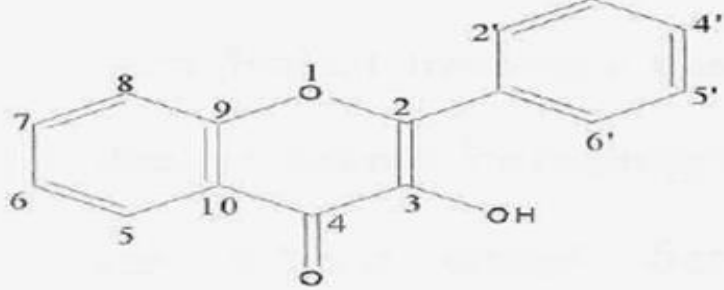
STRUKTUR UMUM FLAVONOID



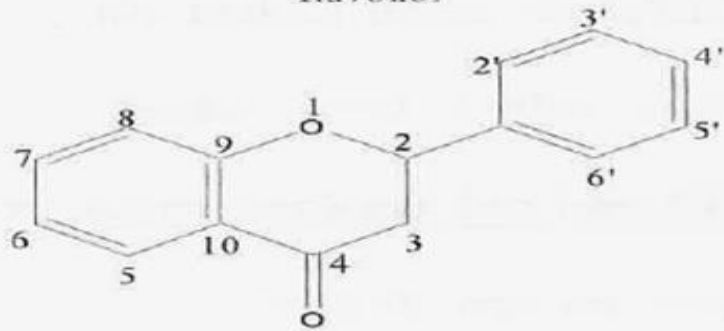
Penamaan dan penomeran flavonoid

OH → pada C3, Keton → C4

Ikatan rangkap di antara C2 dan C3



flavonol



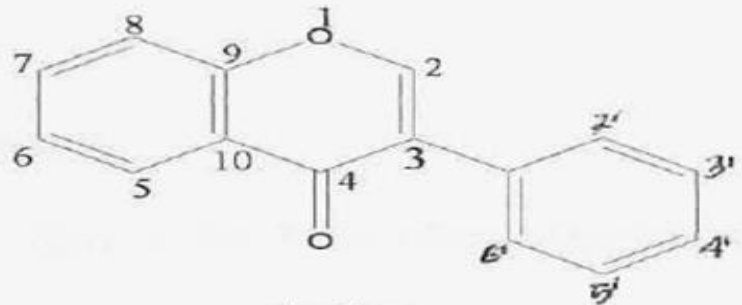
Flavanon

Ikatan rangkap di antara C2 & C3

Keton → C4



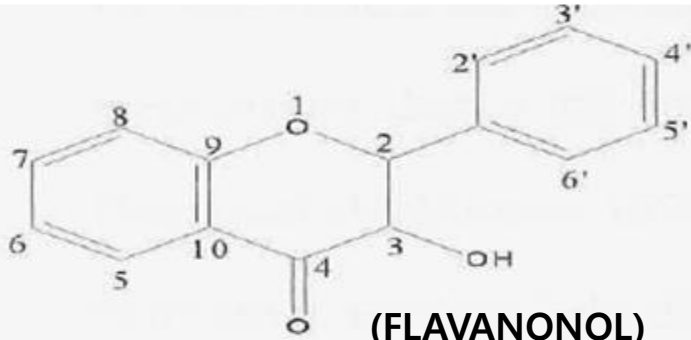
Flavon



isoflavon

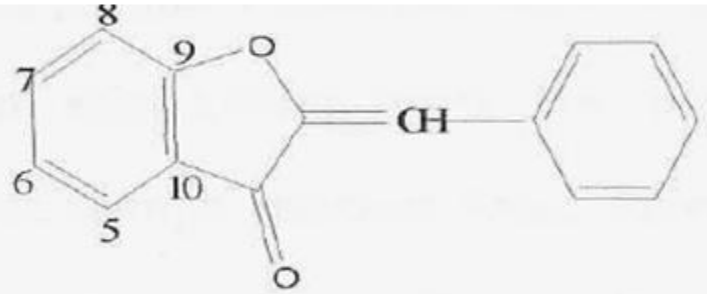
Tidak ada gugus hidroksil (flavan dan keton di C4)

= flavon, tetapi ikatan dengan cincin B pada C3



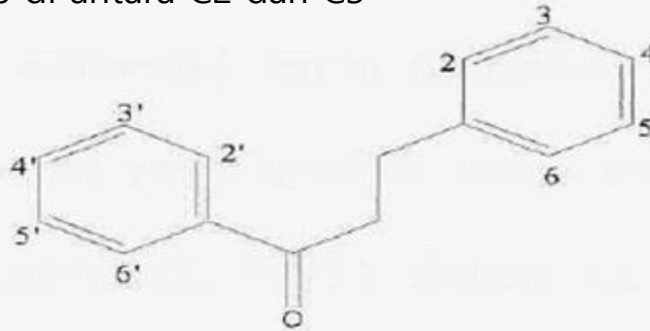
Dihydroflavonol

= flavonol
tapi tidak memiliki ikatan rangkap di antara C2 dan C3



Auron

Salah satu propannya tidak membentuk heterosiklik

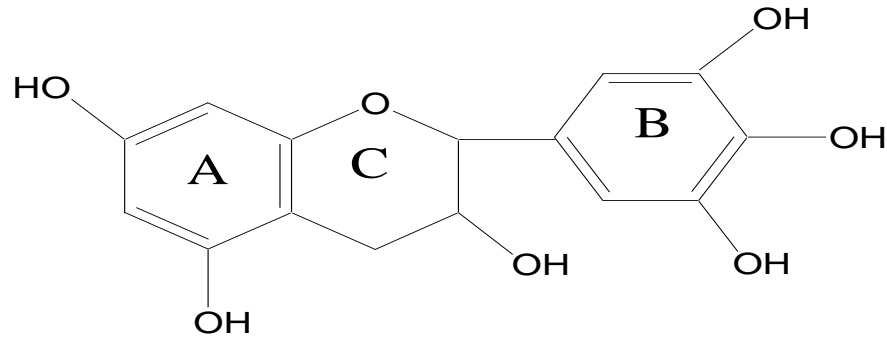


Khalkon

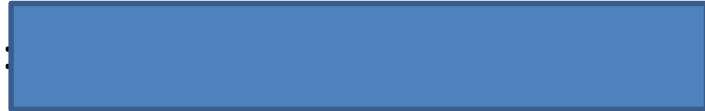
Satu-satunya yang propannya tidak membentuk heterosiklik.

CONTOH SOAL PENAMAAN

GALLOCATHECHIN

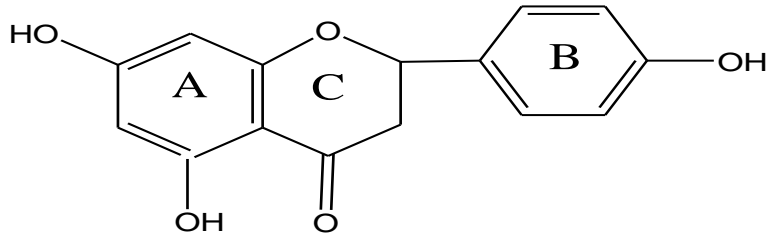


PENAMAAN :



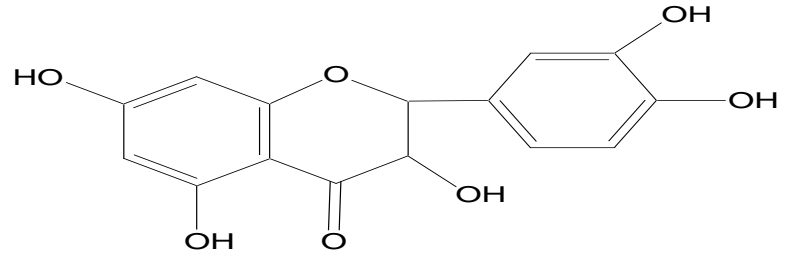
CONTOH SOAL PENAMAAN

NARINGENIN



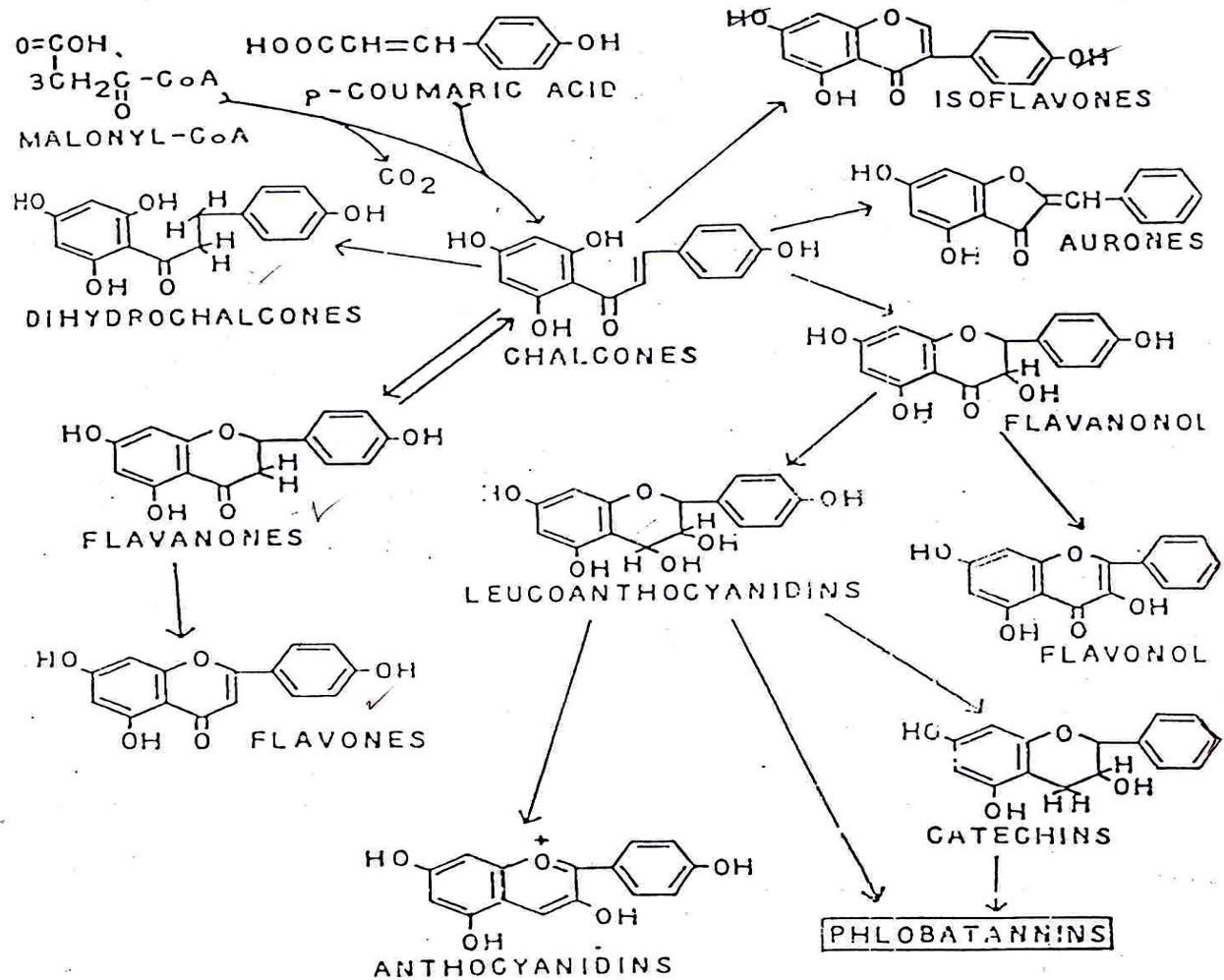
PENAMAAN:

TAKSIFOLIN



Biosintesa Flavonoid

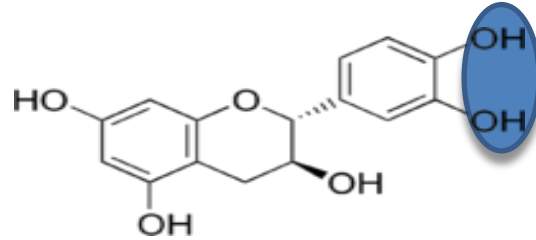
Senyawa **flavonoid** merupakan senyawa **fenolik alam** yang tersebar merata dalam dunia tumbuh-tumbuhan, tidak terdapat dalam mikroorganisme, bakteri, alga, jamur dan lumut. Sebagian besar senyawa flavonoid dalam **bentuk glikosida** dan juga **sebagai aglikon**. Dalam bentuk **glikosidanya flavonoid larut dalam air dan sedikit larut dalam pelarut organik**. Struktur senyawa flavonoid secara biosintesis berasal dari **penggabungan jalur sikimat C6-C3 (cincin A) dan jalur malonat** seperti yang disajikan berikut ini :



**PENGGOLONGAN FLAVONOID,
menurut Swain(1976) dan Geissman(1962) :**

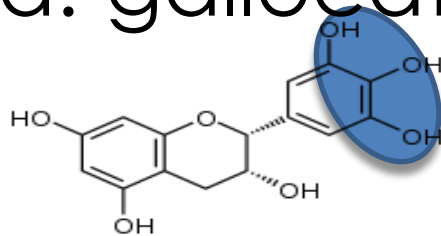
1. Cathecin/ Proanthocynidin
2. Flavanol, Flavanon, Flavanonol
3. Flavone, Flavonol
4. Isoflavon
5. Anthocyanin
6. Auron
7. Chalcon

1. Cathecin/ Proanthocynidin

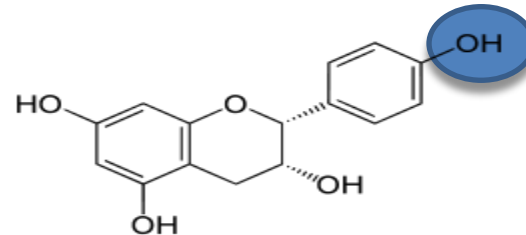


Dilihat dari pengaruh gugus hidroksil, contoh cathecin yaitu:

a. gallocathecin

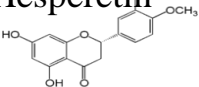
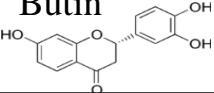
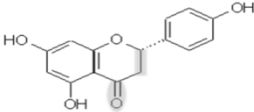
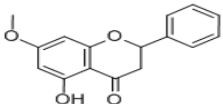
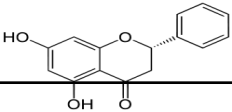


b. Afzelechin



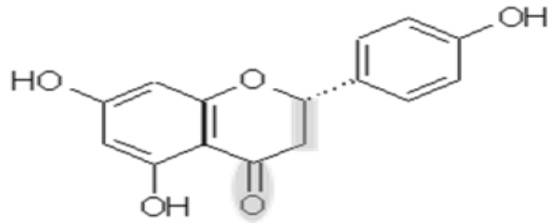
epigallocatechin (EGC), gallocatechin (GC) dan gallocatechin gallate (GCG) yang semuanya merupakan komponen utama teh hijau.



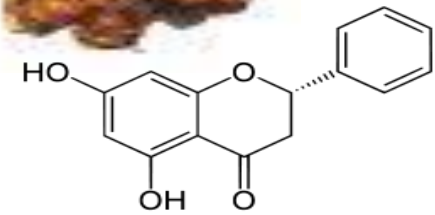
Golongan Flavonoid	Contoh	Bagian Tanaman	Nama Tanaman
Flavanon	<p>Hesperetin</p> 	Buah	<ul style="list-style-type: none"> • <i>Citrus Aurantium L.</i>
	<p>Butin</p> 	Biji	<ul style="list-style-type: none"> • <i>Vernonia anthelmintica</i>
	<p>Naringenin</p> 	Buah	<ul style="list-style-type: none"> • <i>Citrus lemon</i>
	<p>Pinostrobin</p> 	Tunas	<ul style="list-style-type: none"> • <i>Boesenbergia pandurata;</i> • <i>Populus balsamiferaL.</i>
	<p>Pinocembrin</p> 	Fruit peel	<ul style="list-style-type: none"> • <i>Goniothalamus shortchinii</i>

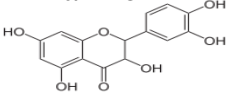
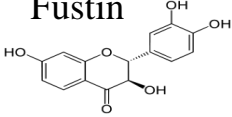
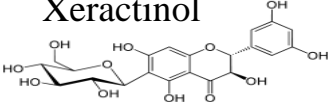
2. FLAVANON

Contoh: Pinocembrin
Terdapat pada tunas
Boesenbergia pandurata;



Contoh : Naringenin
Terdapat pada : buah *Citrus*
lemon

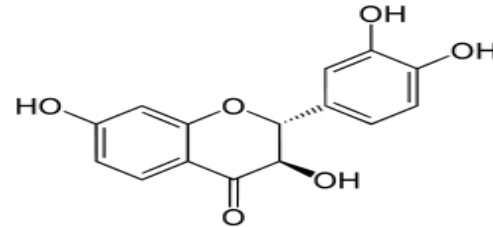


Golongan Flavonoid	Contoh	Bagian Tanaman	Nama Tanaman
Flavanonol	<p>Taxifolin</p> 	Buah	<ul style="list-style-type: none"> • <i>Euterpe oleracea</i> ; • Siberian larch (<i>Larix sibirica</i>)
	<p>Fustin</p> 	Pohon	<ul style="list-style-type: none"> • <i>Cotinus coggygria</i>; • Toxicodendron vernicifluum (<i>Rhus verniciflua</i>)
	<p>Xeractinol</p> 	Daun	<ul style="list-style-type: none"> • Paepalanthus argenteus

2. FLAVANONOL

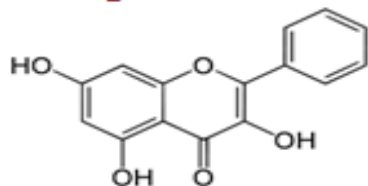


Contoh : Fustin
Terdapat pada :
Pohon *Cotinus coggygria*



Flavonol

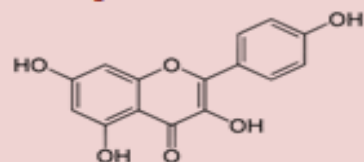
Galangin



Akar

- *Alpinia galangal*

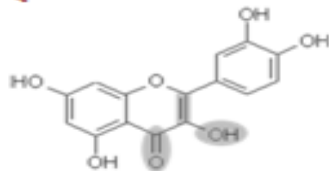
Kaempferol



**Buah;
Daun**

- *Fragraria xananassa*
- *Camellia sinensis*
- *Crocus sativus L.*

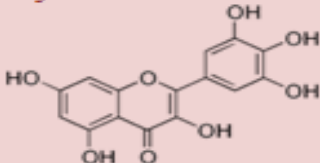
Quercetin



Umbi

- *Alium cepa*

Myricetin

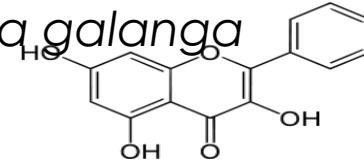


Papyril flavonol A

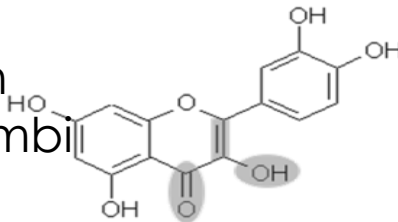
3. FLAVONOL

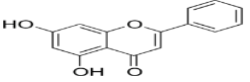
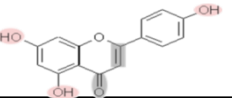
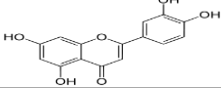
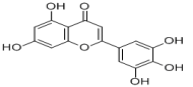
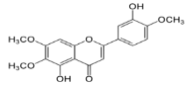
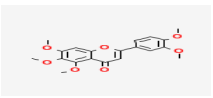
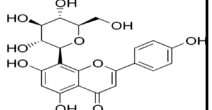
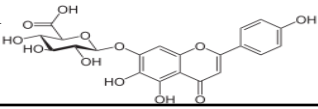
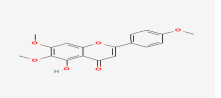


Contoh : Galangin
Terdapat pada : akar
Alpinia galanga



Contoh : Quercetin
Terdapat pada : Umbi
Allium cepa



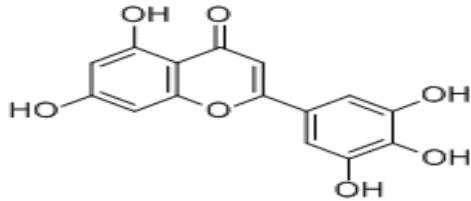
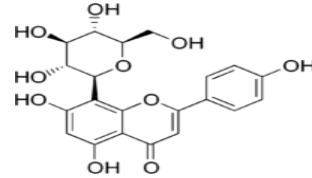
Flavon	Chrysin		Bunga	<ul style="list-style-type: none"> • <i>Passiflora caerulea</i>; • <i>Oroxylum indicum</i>
	Apigenin		Daun; Propolis	<ul style="list-style-type: none"> • <i>Apium graveolens</i>; • <i>C. Sublineolum</i>
	Luteolin		Daun	<ul style="list-style-type: none"> • <i>Salvia tomentosa</i>
	Tricetin		Serbuk sari	<ul style="list-style-type: none"> • <i>Eucalyptus globulus</i>
	Eupatorin		Daun	<ul style="list-style-type: none"> • <i>Orthosiphon stamineus</i>
	Sinensetin		Daun	<ul style="list-style-type: none"> • <i>Orthosiphon stamineus</i>
	Vitexin		Bunga; Daun	<ul style="list-style-type: none"> • <i>Vitex agnus-castus</i>; • <i>Phyllostachys nigra</i>
	Scutellarin			<ul style="list-style-type: none"> • <i>Scutellaria barbata</i>
	Salvigenin		Daun	<ul style="list-style-type: none"> • <i>Salvina triloba</i>
	Kuwanon C			<ul style="list-style-type: none"> • <i>Morus australis</i> • <i>Broussonetia papyrifera</i>

3. FLAVON

Contoh: Vitexin

Terdapat pada: Bunga dan daun

[Vitex agnus-castus](#);



Contoh : Tricetin

Terdapat pada : Serbuk sari
i *Eucalyptus globulus*



Contoh: Sinensetin

Terdapat pada: Daun

Orthosiphon stamineus

IsoFlavone	Genistein [5,7-Dihydroxy-3-(4-hydroxyphenyl) chromen-4-one]	Bunga, biji	<ul style="list-style-type: none"> • <i>Trifolium pratense</i> (Red clover) • <i>Glycine max</i> (L.) Merrill atau Soybean
	Daidzein [7-Hydroxy-3-(4-hydroxyphenyl) chromen-4-one]	Bunga, biji, akar	<ul style="list-style-type: none"> • <i>Trifolium pratense</i> (Red clover) • <i>Glycine max</i> (L.) Merrill atau Soybean • legume <i>Pueraria labata</i> (kudzu)
	Formononetin (Biochanin B) [7-Hydroxy-3-(4-methoxyphenyl) chromen-4-one]	Bunga, Tunas, rimpang,	<ul style="list-style-type: none"> • <i>Trifolium pratense</i> (Red clover) • <i>Black cohosh</i> • <i>Solanum tuberosum</i> (tunas)
	Sophoricoside [5,7-Dihydroxy-3-[4-[(2S,3R,4S,5S,6R)-3,4,5-trihydroxy-6-(hydroxymethyl)oxan-2-yl]oxyphenyl]chromen-4-one]	Buah, daun	<ul style="list-style-type: none"> • <i>Sophora japonica</i> (Leguminosae family) • <i>Styphnolobium japonicum</i> (Pagodatree)
	Glabridin	Akar	<ul style="list-style-type: none"> • <i>Glicirrhiza glabra</i>
	Isosophoranone	Akar	<ul style="list-style-type: none"> • <i>Echinosophora koreensis</i> • <i>Sophora microphilla</i> • <i>Phaseolus lunatus</i>
	Biochanin A [C ₁₆ H ₁₂ O ₅]	Bunga dan biji	<ul style="list-style-type: none"> • <i>Trifolium pratense</i> (Red clover) • <i>Glycine max</i> (L.) Merrill atau Soybean

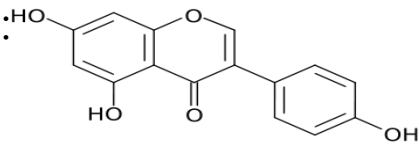
ISOFLAVONE



Pada tanaman

Trifolium pratense (Red clover)

Contoh :



Genistein

[5,7-Dihydroxy-3-(4-hydroxyphenyl) chromen-4-one]

- *Glycine max* (L.) Merrill atau Soy bean



Anthocyanine			
	Aurantianidine	Bunga , buah	<ul style="list-style-type: none"> • <i>Hibiscus mutabilis L.</i> (Waru landak) • <i>Strawbery</i> • <i>Impatient aurantiaca (Balsaminaceae)</i>
	Cyanidine	Bunga, buah, biji	<ul style="list-style-type: none"> • <i>Punica granatum (delima)</i> • <i>Hibiscus mutabilis L.</i> (Waru landak) • <i>Strawbery</i> • <i>Myrica rubra</i> • <i>Blackcurrent</i> • <i>Azolla imbricata</i> • <i>Impatiens balsamina Linn(pacar air)</i>
	Delphinidine	Bunga, biji, buah	<ul style="list-style-type: none"> • <i>Punica granatum (delima)</i> • <i>Hibiscus mutabilis L.</i> (Waru landak) • <i>Blackcurrent</i> • <i>Impatiens balsamina Linn(pacar air)</i>
	Europinidine	Bunga	<ul style="list-style-type: none"> • <i>Hibiscus mutabilis L.</i> (Waru landak)
	Luteolinidine	Bunga	<ul style="list-style-type: none"> • <i>Hibiscus mutabilis L.</i> (Waru landak) • <i>Azolla imbricata</i> • <i>Azolla japonica</i> • <i>Azolla mexicana</i>

Lanjutan Anthocyanine

Pelargonidine	Bunga	<ul style="list-style-type: none">• <i>Punica granatum (delima)</i>• <i>Hibiscus mutabilis L. (Waru landak)</i>• <i>Impatiens balsamina Linn(pacar air)</i>
Malvidine	Bunga	<ul style="list-style-type: none">• <i>Hibiscus mutabilis L. (Waru landak)</i>• <i>Oryza sativa cv. Heugjinjubyeo</i>• <i>Impatiens balsamina Linn(pacar air)</i>
Peonidine	Bunga	<ul style="list-style-type: none">• <i>Hibiscus mutabilis L. (Waru landak)</i>• <i>Cyclamen persicum</i>
Petuinidine	Bunga, buah	<ul style="list-style-type: none">• <i>Hibiscus mutabilis L. (Waru landak)</i>• <i>(Aronia sp)</i>• <i>Saskatoon berries (<i>Amelanchier alnifolia</i>)</i>
Rosinidine	Bunga	<ul style="list-style-type: none">• <i>Hibiscus mutabilis L. (Waru landak)</i>• <i>Catharantus roseus</i>

5. ANTHOCYANINE

Contoh : Auntarantanidine
Terdapat pada:
Hibiscus mutabilis L.
(Waru landak)



6. Auron

Auron	Sulpuretin	Bunga	<ul style="list-style-type: none">• <i>Rhus verniciflua Stokes (Anacardiaceae)</i>
	Aureusidin	Bunga	<ul style="list-style-type: none">• <u><i>Antirrhinum majus</i></u> (Garden snapdragon)• <i>Mussaenda hirsutissima; (Rubiaceae)</i>• <i>Zinnia linearis, (Compositae)</i>
	Leptosin	Bunga	<ul style="list-style-type: none">• <i>Flemengiastrobilifera.</i>

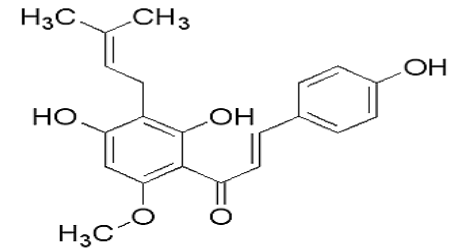
6. Auron



Contoh: Sulfuretin
Terdapat pada :
Dahlia variabilis

7. Chalcone

Chalcone	Xanthohumol	Daun	<i>Hop (Humulus lupulus L.)</i>
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Xanthohumol-The Master Molecule



- Micronutrient that inhibits disease-causing enzymes
- Broad impact on a wide range of metabolic conditions
- Introduced by Oregon State University 10 years ago
- **The most powerful anti-cancer substance up to date**

---Fred Stevenson---

- Extracted from Hops
- Beer contains a very small amount of XN but destroyed during the manufacturing process

No.	Golongan flavonoid	Polaritas	Kelarutan	Pengaruh asam	Pengaruh basa
1.	Cathechin	Polar	Larut dalam air	antosianidin	-
2.	Leukoantosianidin	Polar	Larut dalam air	Menjadi antosianidin	-
3.	Flavanon	Semi polar	Larut dalam pelarut organik	-	Menjadi kalkon
4.	Flavanonol				
5.	Flavon	Semi polar	Larut dalam air panas	Bentuk glikosida terhidrolisis menjadi aglikon dan gula	-
6.	Anthosianidin	Polar	Larut dalam air	Menjadi ion flavilium (kation)	-
7.	Flavonol	Semi polar	Larut dalam air panas		

Bioaktivitas Flavonoid

No	Golongan	Flavonoid	Bioaktivitas
1	Flavon	7,8 - dhidroksiflavon	Anti bakteri (staphylococcus epidermidis)
		Luteolin, Apigenin	Komponen dari virgin olive oil yang berfungsi sebagai anti oksidan
		Luteolin, Apigenin	Menghambat pertumbuhan sel tumor
2	Flavanonol	Taxifolin	antioksidan, anti inflamasi, xantin inhibitor
		Kaempferol	Anti kanker
		Quercetin	Antihepatotoksik, anti tumor, anti oksidan, anti diare, anti virus
3	Flavanon	Rutin, hesperidin	Menghambat proliferasi sel (anti kanker, lemah)
		Eryodictiol	Neuroprotective
		hesperidin, naringin, narirutin	Antioksidan (terdapat pada kulit jeruk)

Bioaktivitas Flavonoid (lanjutan)

No	Golongan	Flavonoid	Bioaktivitas
4	Isoflavon	Genistein	Anti oksidan & Anti tumor, anti fungi
		Rutenone	Insektisida, anti protozoa
5	Flavon	Luteolin	Anti diare & Anti inflamasi
		Apigenin	Anti bakteri, anti inflamasi, diuretik
		Amentoflavone	Inhibitor yang poten terhadap nukleotida phosphodiesterase. Anti fungi.
6	Flavanol	Katekin	Anti kanker
		Epikatekin	Anti diare
		Myricetin	Aktifitas antigonadotropik yang kuat. Anti bakteri terhadap <i>Pseudomonas maltophilia</i> dan <i>Enteromorpha cloacae</i> .
7	Flavanonol	Taxifolin	
8	Flavonon	Butein	Inhibitor NADH oksidase dan suksinosidase.
		Farrerol	Expectorant
		Hesperetin	Anti bakteri dan anti viral.
		Naringenin	Anti bakteri, anti hepato toxic, anti peroxidative, anti spasmodik, anti ulcer dan anti fungi.