

Naturally Occurring Flavonoids

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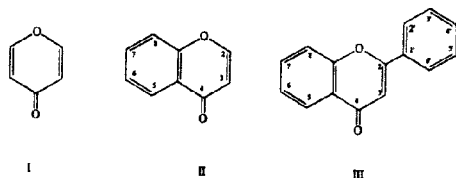
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Summary: Naturally occurring flavonoids from various plants which were reported during the period 1992-2000, have been reviewed.

Introduction

The flavonoids represent an important group of pigments that occur in the plant kingdom. Of all the natural pigments that can be used as dyestuff are widely distributed in nature. They occur naturally in combination with rhamnose or glucose as glycosides sometimes uncombined & frequently also associated with tannins.

The basic unit of the flavone is -pyrone (I). The simplest aromatic derivative of -pyrone is benzo-pyrone (ii). Commonly called chromone. Substitution of benzene derivative in position 2 of the -pyrone nucleus produces 2-phenyl benzopyrone (iii) or flavone [1].



The plants of various species are rich source of flavonoids and their extracts have long been used in folk medicines [2]. Flavonoids, morusin, morusin-4-glucoside and kuwanon-H isolated from the root bark of *Morus alba* were tested against anti-HIV activity and showed positive result [3]. The anti fungal activity of two flavones, one flavone glucoside & a chalcone glucodide isolated from *Clerodendron phlomidis* was studied. The chalcone glucoside was found to be highly promising as a fungicide; pectolinaregenin, flavanone-7-0-glucoside & 7-hydroxy flavone also displayed good activity [4]. Flavonoid rich fraction of the leaf of *Baphia nitida* was formulated into an ointment and tested at 3 dose levels for anti-inflammatory activity against croton oil and heat induced inflammation on ears of mice and depilated backs of rats respectively. Both provide evidence for the ability of this fraction to inhibit the inflammatory condition on the rodents [5]. Isoscutellarein showed anti-influenza virus activity in vitro & more potent virucidal activity in . It also inhibited the lung virus proliferation when

TABLE: LIST OF FLAVONOIDS ISOLATED FROM DIFFERENT PLANT SPECIES.

S.No	Name of Compounds, formula, Molecular weight.	Molecular	M. Points	Source	Parts used	Reference
1.	Chrysoeriol C ₁₆ H ₁₂ O ₆ 300			<i>Impatiens textori</i>	leaves	[11]
2.	Chrysoeriol-7-glucoside C ₂₂ H ₂₃ O ₁₁ 463			"	"	"
3.	Kaempferol-3,6-diglucoside C ₂₇ H ₃₀ O ₁₆ 610			<i>Carthamus tinctorius</i>	Petals	[12]
4.	6-hydroxy Kaempferol C ₁₅ H ₁₀ O ₇ 302			"	"	"
5.	Kaempferol-3,6,7-triglucoside C ₃₃ H ₄₀ O ₂₁ 772			"	"	"

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TABLE: (Continued)

S.No	Name of Compounds, Molecular formula, Molecular weight.	M. Points	Source	Parts used	Reference
6.	Kaemferol-3-rutinoside-6-glucoside C ₃₃ H ₄₀ O ₂₀ 756		"	"	"
7.	Hispidulin-7-O-β-D-glucuronide C ₂₂ H ₂₆ O ₁₂ 476		Clerodendron indicum	aerial parts	[13]
8.	Scutellarein-7-O-β-D- glucuronide C ₂₁ H ₁₈ O ₁₂ 492		"	"	"
9.	Astragaliquinone C ₁₂ H ₁₆ O ₆ 316	125-26°	Astragalus alexandrinus, Astragalus Trigonus	roots	[14]
10.	Mucroquinone C ₁₂ H ₁₆ O ₆ 316	169-72°	"	"	"
11.	Claussequinone C ₁₀ H ₁₄ O ₅ 286	189-94°	"	"	"
12.	8-methoxy vestitol C ₁₂ H ₁₈ O ₅ 302		"	"	"
13.	Vestitol C ₁₆ H ₂₀ O ₆ 332		"	"	"
14.	7-Hydroxy-2,3,4,-trimethoxy isoflavane C ₁₈ H ₂₁ O ₅ 317		"	"	"
15.	7-O-Methyl isomucronulatol C ₁₈ H ₂₁ O ₅ 316	140-41°	Astragalus mongholicus	roots	[15]
16.	Isomucronulatol-7,2'-diglucoside C ₂₉ H ₃₈ O ₁₆ 649	150-51°	"	"	"
17.	5'-hydroxy isomucronulatol-2',5'- diglucoside C ₂₉ H ₃₈ O ₁₆ 665	160-620°	"	"	"
18.	Di-O-Methyl nussolin C ₁₈ H ₁₉ O ₅ 314	136-370°	"	"	"
19.	Linarin C ₂₈ H ₃₂ O ₁₄ 593	268-70°	Cirsium rhinoceros	Aerial parts	[16]
20.	Pectolarigenin C ₁₂ H ₁₄ O ₆ 314		"	"	"
21.	Pectolarigenin-7-O-β-D- glucopyranoside C ₂₃ H ₂₄ O ₁₁ 476		"	"	"
22.	Apigenin-7-O-β-D-glucoside C ₂₁ H ₂₀ O ₁₀ 432		Malva sylvestris	Flowers	[17]
23.	Apigenin-4-O-β-D-Glucosids C ₂₁ H ₂₀ O ₁₀ 432		"	"	"
24.	Quercetin -3-Me ether C ₁₆ H ₁₂ O ₈ 332		Rosa pomifera	Leaves	[18]

TABLE: (Continued)

S.No	Name of Compounds, formula, Molecular weight.	Molecular	M. Points	Source	Parts used	Reference
25.	Quercetin-3-O-β-D-galactopyranoside C ₂₁ H ₂₀ O ₁₂ 464			"	"	"
26.	Quercetin-3-O-β-D-glucopyranoside C ₂₁ H ₂₀ O ₁₂ 464			"	"	"
27.	Quercetin-3,7-O-glucoside C ₂₇ H ₃₀ O ₁₇ 626			"	"	"
28.	Kaempferol-3-O-β-D-glucopyranoside C ₂₁ H ₂₀ O ₁₁ 448			"	"	"
29.	Formononetin C ₁₆ H ₁₂ O ₄ 268		258°	Soybean	"	[19]
30.	Dihydromyricetin C ₁₅ H ₁₂ O ₈ 320			Ampelopsis cantoniensis	leaves	[20]
31.	Hesperitin C ₁₆ H ₁₄ O ₆ 302		226-28°	Ilex centrochinensis	"	[21]
32.	Hesperidin C ₂₈ H ₃₄ O ₁₅ 610		258-62°	"	"	"
33.	Cynaroside C ₂₁ H ₂₀ O ₁₁ 448		254-55°	Cynara scolymus	leaves & flowers	[22]
34.	Luteolin-7-O-β-D-glucopyranoside C ₂₁ H ₂₀ O ₁₁ 448			Betula platyphylla	"	[23]
35.	Luteolin-5-O-β-D-glucopyranoside C ₂₁ H ₂₀ O ₁₁ 448			"	"	"
36.	Irisolone C ₁₇ H ₁₂ O ₆ 312		269-70°	Iris species	"	[24]
37.	5,3'-dihydroxy-3,6,7,8,4'-pentamethoxy flavone C ₂₀ H ₂₀ O ₉ 404			Polanesia dodecandra	"	[25]
38.	5,4'-dihydroxy-3,6,7,8,3'-pentamethoxy flavone C ₂₀ H ₂₀ O ₉ 404			Polanesia dodecandra	"	"
39.	5,6,7-trihydroxy flavanone-7-glucoside C ₂₁ H ₂₀ O ₁₅ 510			Cephalocercus senilis	leaves & flowers	[26]
40.	Naringenin-7-O-β-D-glucopyranoside C ₂₁ H ₂₂ O ₁₀ 434			Cudronia tricuspidata	leaves & stems	[27]
41.	Subscandinin C ₁₇ H ₁₄ O ₁₀ 380		173-75°	Chromolaena subscandens	leaves	[28]
42.	Isoquercitrin C ₂₁ H ₂₀ O ₁₁ 464		225-27°	Taxillus levinei	leaves	[29]
43.	Quercetin-3-O-glucoside C ₂₁ H ₂₁ O ₁₃ 464		149°	"	"	"

TABLE: (Continued)

S.No	Name of Compounds, Molecular formula, Molecular weight.	M. Points	Source	Parts used	Reference
44.	Rutin C ₂₇ H ₃₀ O ₁₆ 610	241-45 ^o	Glycyrrhiza species	"	"
45.	Kaempferol C ₁₅ H ₁₀ O ₆ 286	276-78 ^o	"	"	"
46.	Genistein C ₁₅ H ₁₀ O ₅ 270	297-98 ^o	"	"	"
47.	Astragalin C ₂₁ H ₂₀ O ₁₁ 448	179-80 ^o	"	"	"
48.	Pinocembrin C ₁₃ H ₁₀ O ₄ 254	217 ^o	"	"	"
49.	8-methoxy kaempferol C ₁₆ H ₁₂ O ₇ 316		Crataegus monogyna	Pollen grain	[30]
50.	8-methoxy kaempferol-6- glucoside C ₂₂ H ₂₂ O ₁₂ 478	258-60 ^o	"	"	"
51.	8-methoxy kaempferol-3- glucoside C ₂₂ H ₂₂ O ₁₂ 478	173-75 ^o	"	"	"
52.	Quercetin C ₁₅ H ₁₀ O ₇ 302		Pomoea batatas	Stems & leaves	[31]
53.	Kaempferol-4',7'-di-Me ether C ₁₇ H ₁₄ O ₇ 330		"	"	"
54.	5,2-dihydroxy-7,4'-dimethoxy flavanone C ₁₇ H ₁₆ O ₆ 316		Artocarpus heterophyllus	"	[32]
55.	Sakuranetin C ₁₆ H ₁₄ O ₅ 286	152 ^o	Heliotropium species	leaves	[33]
56.	Pinostrobin C ₁₆ H ₁₂ O ₄ 270		"	"	"
57.	Diosmetin C ₁₆ H ₁₂ O ₆ 300		Carduus pyenocephalus	Aerial parts	[34]
58.	Myricetin C ₁₅ H ₁₀ O ₈ 318	357 ^o	Glycyrrhiza species	Aerial parts	[35]
59.	Myricetin-3-O rhamnoglucoside C ₂₇ H ₃₀ O ₁₇ 626		"	"	"
60.	5-hydroxy-6-7,3',4'-tetramethoxy flavone C ₁₉ H ₁₈ O ₇ 358		Centaurea rothmalerana	"	[36]
61.	Jaceosidin C ₁₇ H ₁₁ O ₇ 220	220-22 ^o	"	"	"
62.	Scutellarein C ₁₅ H ₁₀ O ₆ 286	300 ^o	Striga passargei	Whole plant	[37]
63.	Gardenin-D C ₁₉ H ₁₈ O ₈ 374	190-92 ^o	Sideritis species	"	[38]

TABLE: (Continued)

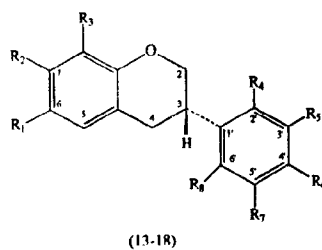
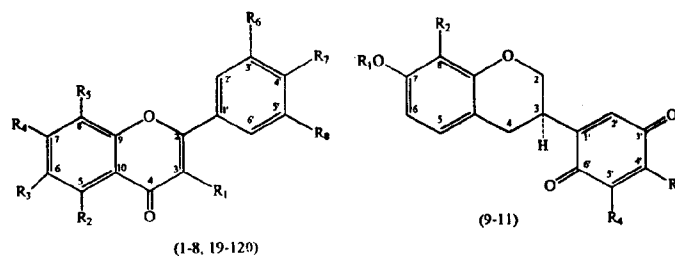
S.No	Name of Compounds, formula, Molecular weight.	Molecular	M. Points	Source	Parts used	Reference
64.	Santin C ₁₈ H ₁₆ O ₇ 344			Crataegus tanacetifolia	"	[39]
65.	Vitexin C ₂₁ H ₂₂ O ₁₀ 434			"	"	"
66.	Hispidulin C ₁₆ H ₁₂ O ₆ 300			Eupatorium cannabinum	Aerial parts	[40]
67.	Eupafolin C ₁₆ H ₁₂ O ₇ 316		260-62°	Eupatorium cannabinum	"	"
68.	Quercetin-3-O-β-D-galactoside C ₂₁ H ₂₁ O ₁₃ 481			Euphorbia nubica	Shoots	[41]
69.	Cirsilineol C ₁₈ H ₁₆ O ₇ 344			Thymus herbabarona	Whole plant	[42]
70.	Hypericin C ₃₀ H ₁₆ O ₈ 504		320°	Hypericum perforatum	Whole plant	[43]
71.	Rhamnetin C ₁₆ H ₁₂ O ₇ 316		292-94°	Mosla chinensis	"	[44]
72.	Desmos flavone C ₁₈ H ₁₆ O ₄ 296			Desmos cochinchinensis	"	[45]
73.	5,7,3-trihydroxy flavanone C ₁₅ H ₁₂ O ₅ 272			Flourensia retinophylla	"	[46]
74.	5,7-dihydroxy-3'-methoxy flavanone C ₁₆ H ₁₄ O ₅ 286			"	"	"
75.	Kaempferol-3-rhamnoside C ₂₁ H ₂₁ O ₁₁ 449			Geranium thunbergii	"	[47]
76.	Kaempferol-3-arabinoside-7-rhamnoside C ₂₆ H ₃₀ O ₁₆ 598			"	"	"
77.	Kaempferol-3,7-dirhamnoside C ₂₇ H ₃₀ O ₁₄ 578			"	"	"
78.	6-hydroxy kaempferol-3,6-di-Me ether C ₁₇ H ₁₄ O ₆ 314			Achillea micrantha	Stems and leaves	[48]
79.	Quercetagetin-3,6,3'-tri-Me ether C ₁₈ H ₁₆ O ₁₁ 408			"	"	"
80.	Quercetagetin C ₁₅ H ₁₀ O ₈ 318		318°	Tagetes zipaquirensis	Whole plant	[49]
81.	Quercetagetin-3-O-β-D-glucoside C ₂₁ H ₂₁ O ₁₄ 497			"	"	"
82.	Luteolin-7-O-β-D-glucoside C ₂₁ H ₂₀ O ₁₂ 464			Tanacetum vulgare	"	[50]
83.	Prunetin C ₁₆ H ₁₂ O ₅ 284		240°	Glycyrrhiza glabra	Whole plant	[51]

TABLE: (Continued)

S.No	Name of Compounds, Molecular formula, Molecular weight.	M. Points	Source	Parts used	Reference
84.	Quercetagenin-3-arabinogalactoside C ₂₆ H ₂₉ O ₁₉ 745		Tagetes minuta	leaves	[52,53]
85.	Patuletin C ₁₅ H ₉ O ₄ 243		"	"	"
86.	Patutetin-7-O-β-D-glucoside C ₂₁ H ₂₆ O ₁₀ 432		"	"	"
87.	Patutetin-7-O-β-D-rutinoside C ₂₇ H ₃₀ O ₁₄ 578		"	"	"
88.	Isorhamnetin-3-O-rutinoside C ₂₇ H ₃₂ O ₁₇ 629		"	"	"
89.	Patuletin-3-O-glucoside C ₂₁ H ₂₆ O ₁₀ 432	160-62 ^o	"	"	"
90.	Kaempferol-7-O-rutinoside C ₂₇ H ₃₁ O ₁₆ 611		"	"	"
91.	Daidzein C ₁₅ H ₁₀ O ₄ 254	315-23 ^o	Lespedeza nakaii	Stems	[19,54]
92.	Daidzin C ₂₁ H ₂₀ O ₉ 416	234-36 ^o	"	"	"
93.	5,7,3'-trihydroxy-8,4'-5'-trimethoxy flavone C ₁₈ H ₁₆ O ₈ 360		Tibetan herb	Stems leaves	and [55]
94.	Quercetin-3-O-β-D- rhamnopyranoside C ₂₂ H ₂₀ O ₁₂ 476		Ipomoea batatas	Whole Plant	[56]
95.	Catechins C ₁₅ H ₁₄ O ₆ 290	212-16 ^o	Cotton	Stems leaves	and [57]
96.	Isorhamnetin C ₁₅ H ₁₂ O ₇ 304	241-42 ^o	Arnica longifolia	Flowers	[58]
97.	Spinacetin C ₁₇ H ₁₄ O ₈ 346	239-41 ^o	"	"	"
98.	Veronicafolin C ₁₈ H ₁₆ O ₈ 360	273-75 ^o	"	"	"
99.	Apigenin-7-4'-dimethyl ether C ₁₇ H ₁₄ O ₅ 298		"	"	"
100.	Velutin C ₁₇ H ₁₄ O ₆ 314	191-93 ^o	"	"	"
101.	Pilloin C ₁₇ H ₁₄ O ₆ 314	207-210 ^o	"	"	"
102.	Cirisimaretin C ₁₆ H ₁₂ O ₆ 300		"	"	"
103.	Desmethoxy centraureidin C ₁₇ H ₁₄ O ₇ 330		"	"	"

TABLE: (Continued)

S.No	Name of Compounds, Molecular formula, Molecular weight.	M. Points	Source	Parts used	Reference
104.	Eupatorin C ₁₈ H ₁₆ O ₇ 344	251-54 ^o	"	"	"
105.	Eupafolin-7-O-β-D-glucoside C ₂₂ H ₂₁ O ₁₂ 477		"	"	"
106.	Robinin C ₃₃ H ₁₀ O ₁₉ 740	249-50 ^o	"	"	"
107.	Trifolin C ₂₁ H ₁₉ O ₁₂ 464	225-27 ^o	"	"	"
108.	Robigenin C ₂₁ H ₂₁ O ₁₃ 481	172 ^o	"	"	"
109.	Isorhamnetin-3-O-β-D-glucoside C ₂₂ H ₂₃ O ₁₃ 495	175-77 ^o	"	"	"
110.	Spinacetin-3-O-β-D-glucoside C ₂₃ H ₂₃ O ₁₃ 507	274-76 ^o	"	"	"
111.	Quercetin-3-O(6"-O-acetyl) glucoside C ₂₃ H ₂₁ O ₁₃ 505	-β-D-	"	"	"
112.	Patuletin-3-O(6"-O-acetyl) glucoside C ₂₄ H ₂₃ O ₁₃ 519	-β-D-	"	"	"
113.	5-hydroxy-6,7-dimethoxy flavone C ₁₇ H ₁₄ O ₅ 298		Mosla chinensis	Whole plant	[59]
114.	5-hydroxy-6-methyl flavone C ₁₆ H ₁₂ O ₅ 252		"	"	"
115.	5,7-dihydroxy-4'-methoxy flavone C ₁₆ H ₁₂ O ₅ 284		"	"	"
116.	Apigenin C ₁₅ H ₂₀ O ₅ 270	347-48 ^o	"	"	"
117.	Kaempferol-3-O-β-D-glucoside C ₂₁ H ₂₀ O ₁₁ 448		"	"	"
118.	Morin C ₁₅ H ₁₀ O ₇ 302	285-90 ^o	"	"	"
119.	Morin-7-O-β-D-glucoside C ₂₂ H ₂₁ O ₁₃ 493		"	"	"
120.	Rhamnocitrin C ₁₆ H ₁₂ O ₅ 284	217-18 ^o	"	"	"
121.	Luteolin C ₁₅ H ₁₀ O ₆ 286		Aguilegia oxyscopola	Whole Plant	[60]
122.	Chrysin C ₁₅ H ₁₀ O ₄ 254		Bcijing Propolis	"	[61]



S.No.	R1	R2	R3	R4	R5	R6	R7	R8
1.	H	OH	H	OH	H	OMe	OH	H
2.	H	OH	H	Glc	H	OMe	OH	H
3.	Glc	Glc	H	OH	H	H	OH	H
4.	OH	OH	OH	OH	H	H	OH	H
5.	Glc	OH	Glc	Glc	H	H	OH	H
6.	Rut	OH	Glc	OH	H	H	OH	H
7.	H	OH	OMe	OH	H	H	OH	H
8.	H	OH	OH	GR	H	H	OH	H
9.	Me	OMe	OH	H				
10.	H	OMe	H	OMe				
11.	H	H	H	OMe				
13.	H	OH	OMe	OH	H	OMe	H	H
14.	H	OH	H	OH	H	OMe	H	H
15.	H	OH	H	OMe	OMe	OMe	H	H
16.	H	OMe	H	H	H	OMe	OMe	OH
17.	H	Glc	H	H	H	OMe	OMe	Glc
18.	H	OH	H	H	OMe	OMe	OMe	Glc
19.	H	OH	H	Rut	H	H	OMe	H
20.	H	OH	OMe	OH	H	H	OMe	H
21.	H	OH	OMe	OH	H	H	OMe	H
22.	H	OH	H	Glc	H	H	OH	H
23.	H	H	H	OH	H	H	Glc	H
25.	GaP	OH	H	OH	H	H	OH	H
26.	GP	OH	H	OH	H	H	OH	H
27.	Glc	OH	H	Glc	H	OH	OH	H
28.	GP	OH	H	OH	H	H	OH	H
31.	H	OH	H	OH	H	H	OH	H
32.	H	OH	H	Rut	H	OH	OMe	H
33.	H	OH	H	Glc	H	OH	OH	H
34.	H	OH	H	GP	H	OH	OH	H
35.	H	GP	H	OH	H	OH	OH	H
37.	OMe	OH	OMe	OMe	OMe	H	OMe	H
38.	OMe	OH	OMe	OME	OMe	OMe	OH	H
42.	Glc	OH	H	OH	H	OH	OH	H
43.	Glc	OH	H	OH	H	OH	OH	H
44.	Rut	OH	H	OH	H	OH	OH	H
45.	OH	H	OH	OH	H	H	OH	H
47.	H	H	H	AG	H	H	OH	H
48.	H	OH	H	OH	H	H	H	H
49.	OH	OH	H	OH	OMe	H	OH	H

S.No.	R1	R2	R3	R4	R5	R6	R7	R8
50.	GLc	OH	H	OH	OMe	H	OH	H
52.	OH	OH	H	OH	H	OH	OH	H
55.	H	OH	H	OMe	H	H	OH	H
56.	H	OH	H	OMe	H	H	OH	H
58.	OH	OH	H	OH	H	OH	OH	H
59.	RG	OH	H	OH	H	OH	OH	H
60.	H	OH	OMe	OMe	H	OMe	OMe	H
61.	H	OH	OMe	OH	H	H	OH	OMe
62.	H	OH	OH	OH	H	H	OH	H
64.	OMe	OH	OMe	OH	H	H	OMe	H
65.	H	OH	H	OH	GLc	H	H	H
66.	H	OH	OMe	OH	H	H	OH	H
67.	H	OH	OMe	OH	H	H	OH	OH
68.	Gal	OH	H	OH	H	OH	OH	H
69.	H	OH	OMe	OMe	H	OMe	OH	H
71.	OH	OH	H	OMe	H	OH	OH	H
72.	H	OH	Me	OMe	Me	H	H	H
75.	Rha	OH	H	OH	H	H	OH	H
76.	Ara	OH	H	Rha	H	H	OH	H
77.	Rha	OH	H	Rha	H	H	OH	H
78.	OH	OH	OH	OH	H	OH	OH	H
79.	Glc	OH	OH	OH	H	OH	OH	H
80.	H	OH	H	OH	H	OH	OH	H
82.	AG	OH	OH	OH	H	OH	OH	H
85.	OH	H	H	OH	H	OH	OH	H
86.	OH	H	OH	Glc	H	OH	OH	H
87.	Rut	H	OMe	OH	H	OH	OH	H
88.	Gal	OH	OMe	OH	H	OMe	OH	H
89.	Glc	H	OMe	OH	H	OH	OH	H
90.	H	OH	H	Rut	H	H	OH	H
92.	H	OH	H	OH	OMe	OH	OMe	OMe
94.	RP	OH	H	OH	H	H	OH	H
96.	OH	OH	H	OH	H	OMe	OH	H
97.	OH	OH	OMe	OH	H	OMe	OH	H
98.	OH	H	OMe	OMe	H	OMe	OH	H
99.	H	OH	H	OMe	H	H	OMe	H
100.	H	OH	H	OMe	H	OMe	OH	H
101.	H	OH	H	OMe	H	OH	OMe	H
102.	H	OH	OH	OMe	H	H	OH	H
103.	H	OH	OMe	OH	H	OMe	OH	H
104.	H	OH	OMe	OMe	H	OH	OH	H
105.	H	OH	OMe	Glc	H	OH	OH	H
107.	Glc	OH	H	OH	H	OH	OH	H
108.	Glc	OH	H	OH	H	H	OH	H
109.	Glc	OH	H	OH	H	OMe	OH	H
110.	GLc	OH	OMe	OH	H	OMe	OH	H
111.	GA	OH	OMe	OH	H	H	OH	H
112.	GA	H	OMe	OH	H	OH	OH	H
113.	H	OH	H	OMe	OMe	H	H	H
114.	H	OH	OMe	H	H	H	H	H
115.	H	OH	H	OH	H	H	OMe	H
116.	H	OH	H	OH	H	H	OH	H
117.	OH	OH	H	OH	H	H	OH	H
120.	OH	OH	H	OMe	H	H	OH	H

Glc = o-glucoside RP= Rhamnopyranoside
Rut= Rutinose Ara= Arabinose
Gal= Galactose GP= Glucopyranoside
Rha= Rhamnose Gap= Galactopyranoside
GR= Glucuronosids

administered intranasally or orally to mice [6]. The effect of plant flavonoids on enzyme systems, immune cells, muscle cells, viruses, the endocrine system and cancer have been reported [7]. Galangin, one of the active flavonoid compound, was administered to mice in order to compare their anticlastogenic effect against 3 different kinds of carcinogens. It showed a stronger clastogenic effect [8]. Quercetin selectively inhibits the growth of transformed - tumorigenic cells & prevents the neoplastic transformation of NIH/3T3 cells [9]. The effect of 31 flavonoids on human cancer cell proliferation was studied & their structure activity was rationalized. The flavonoids possessing the C_{2,3}-double bond were the most potent cytotoxic groups of compounds [10].

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