CHAPTER II

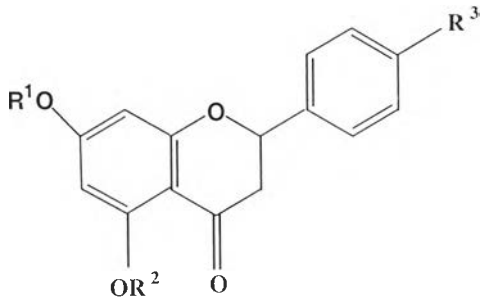
LITERATURE REVIEW

2.1 CHEMICAL CONSTITUENTS FOUND IN BLACK RHIZOMES *Boesenbergia pandurata.*

In 1982 Pittaya Tuntiwachwuttikul et al. (14) investigated the chemical constituents from black rhizomes of *B. pandurata* and found 11 flavonoids which were 2 flavanones and 9 flavones. Later in 1987 Pittaya Tuntiwachwuttikul et al. (15) reinvestigated the chemical constituents of *B. pandurata* and found 1 flavanone, 2 flavones and 2 chalcones. Sixthteen flavonoids are shown in **Table 2.1** and **Fig 2.1, 2.2, 2.3**.

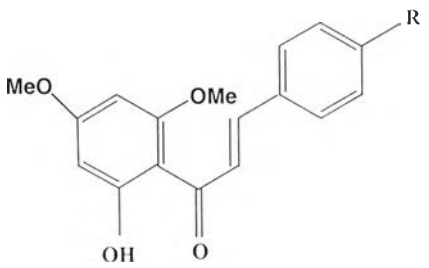
Table 2.1 Sixthteen flavonoid compounds from black rhizomes *B. pandurata.*

Scientific name	Plant parts	Substances	References
Bosenbergia pandurata (black rhizomes)	Rhizomes	5-hydroxy-7-methoxyflavanone 5,7-dimethoxyflavanone 5-hydroxy-7-methoxyflavone 5-hydroxy-7,4'-dimethoxyflavone 5,7-dimethoxyflavone 5,7,4'-trimethoxyflavone 5,7,3',4'-tetramethoxyflavone 5-hydroxy-3,7-dimethoxyflavone 5-hydroxy-3,7,4'-trimethoxyflavone 3,5,7-trimethoxyflavone 5-hydroxy-3,7,3',4'-tetramethoxyflavone	14
Bosenbergia pandurata (black rhizomes)	Rhizomes	3,5,7,3',4'-pentamethoxyflavone 3,5,7,4'-tetramethoxyflavone 5-hydroxy-7,4'-dimethoxyflavanone 2'-hydroxy-4',6'-dimethoxychalcone 2'-hydroxy-4,4',6'-trimethoxychalcone	15



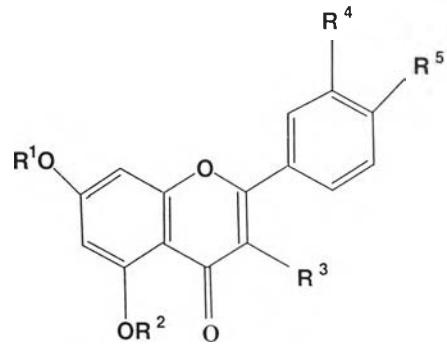
	R^1	R^2	R^3
5-hydroxy-7-methoxyflavanone	Me	H	H
5,7-dimethoxyflavanone	Me	Me	H
5-hydroxy-7,4'-dimethoxyflavanone	Me	H	OMe

Figure 2.1 Structure of 3 flavanone compounds from *B. pandurata.*



	R
2'-hydroxy-4',6'-dimethoxychalcone	H
2'-hydroxy-4,4',6'-trimethoxychalcone	OMe

Figure 2.2 Structure of 2 chalcone compounds from *B.pandurata.*



	R^1	R^2	R^3	R^4	R^5
5-hydroxy-7-methoxyflavone	Me	H	H	H	H
5-hydroxy-7,4'-dimethoxyflavone	Me	H	H	H	OMe
5,7-dimethoxyflavone	Me	Me	H	H	H
5,7,4'-trimethoxyflavone	Me	Me	H	H	OMe
5,7,3',4'-tetramethoxyflavone	Me	Me	H	OMe	OMe
5-hydroxy-3,7-dimethoxyflavone	Me	H	OMe	H	H
5-hydroxy-3,7,4'-trimethoxyflavone	Me	H	OMe	H	OMe
3,5,7-trimethoxyflavone	Me	Me	OMe	H	H
5-hydroxy-3,7,3',4'-tetramethoxyflavone	Me	H	OMe	OMe	OMe
3,5,7,3',4'-pentamethoxyflavone	Me	Me	OMe	OMe	OMe
3,5,7,4'-tetramethoxyflavone	Me	Me	OMe	H	OMe

Figure 2.3 Structure of 11 flavone compounds from *B.pandurata.*

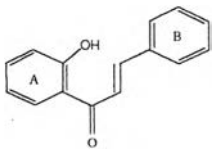
At present more than 4,000 flavonoids are reported. They occure widely in common edible fruits, leaves, seeds and other parts of food plants as either glycosides or aglycones. They include a variety of phenolic compounds with a C_6- C_3- C_6 chemical structure which combine 2 molecules of benzene ring with 3 carbon atoms. Flavonoid groups can be devided into 13 types as the following

1) Chalcone
2) Dihydrochalcone
3) Aurone
4) Isoflavone
5) Flavanone
6) Dihydroflavonol
7) Flavonols
8) Flavone
9) Flavane
10) Catechin
11) Leucoanthocyanidin
12) Anthrocyanidin
13) Biflavonoids

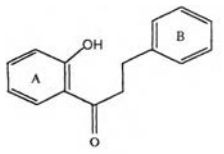
The structure of these compounds are shown in **Fig. 2.4** (16,17).

Many compounds in flavonoid groups had been investigated for biological activity and they were found to have differ biological activity. Biological activity of flavonoid groups is related to the structure, substituent group and position of substituent group in structure, for example, hydroxy groups at 5 and 7 position, double bond between carbon 2 and 3 will increase the potential inhibition of Xanthine Oxidase which catalysis the oxidation of hypoxanthine and xanthine to uric acid, which was the cause of gout disease. In addition some subsituent group of flavonoid compounds may decrease the biological activity of flavonoid compounds. Such as the methoxy group will decrease the antioxidant potential (18-21).

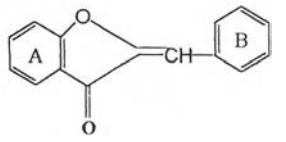
At present flavonoid compounds were found to have various biological activities such as cytotoxicity of cancer cell lines, antioxidant, inhibition of Xanthine Oxidase, inhibition of cyclic AMP. Therefore this research, not only studying the chemical constituents of *K. parviflora* and cytotoxicity against cancer cell lines, but also studying other biological assay such as antioxidant as well.



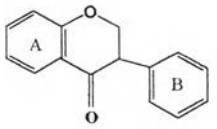
Chalcone



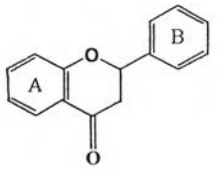
Dihydrochalcone



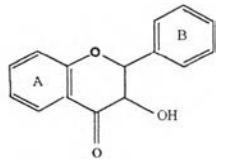
Aurone



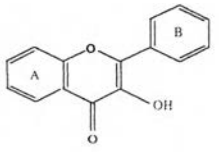
Isoflavone



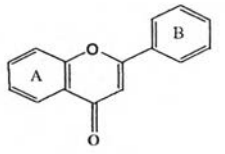
Flavanone



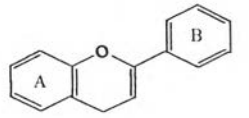
Dihydroflavonol



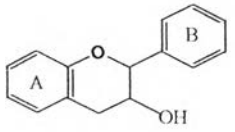
Flavonol



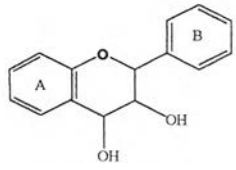
Flavone



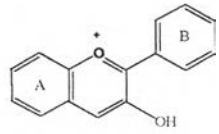
Flavane



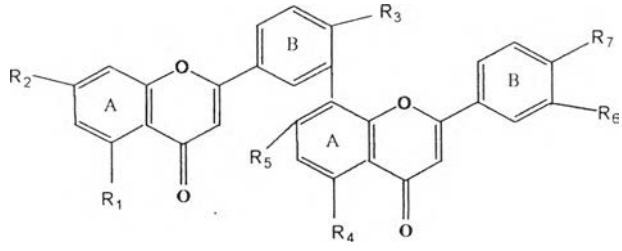
Catechin



Leucoanthocyanidin



Anthrocyanidin



Biflavonoid

Figure 2.4 Structure of 13 flavonoid groups.