



CHAPTER I

INTRODUCTION

A large number of plants in Thailand have been used as traditional medicine for a long time. In the past medicinal plants have been the primary treatment in the health care system. At present they also play an important role in modern medicine, because they are available in modern form, have good efficiency, inexpensive and believed to possess less side effect than synthetic drugs. Thai medicinal plants are also used in the kitchen e.g. as food, spices and in the cosmetic industry.

Mayee is a medicinal plant belonging to the Zingiberaceae family, Zingiber genus. The Zingiber genus has many species in Thailand but some of the most common species are: [1,2]

1. *Zingiber officinale* Rosc. (Khing)
2. *Zingiber cassumunar* Roxb. (Phlai)
3. *Zingiber spectabile* Griff. (Phlai-muang)
4. *Zingiber offensii* Val. (Phlai-dam)
5. *Zingiber rubens* Roxb. (Mayee)
6. *Zingiber zerubet* Smith. (Ka-thue)

In the past, Zingiber species plants have been used in traditional medicine. The claimed efficacies in Thai traditional medicinal text books [3,4] are as

follows: *Zingiber officinale* Rosc. (Khing) for treatment of scabulous constipation, for promoting longevity, as a digestive stimulant, as a carminative, and for relief of nausea and vomiting; *Zingiber cassumunar* Roxb.(Phlai) for longevity, wound healing, treatment of menstrual disorders, contusions and antidiarrheal, *Zingiber zerumbet* Smith. (Ka-thue) treatment of sprain and bodily discomfort, abdominal discomfort and for enhancing appetite. Its also has been found to be efficient as an antibacterial, an anti-inflammatory, antiemetic and mutagenic activity. In addition, *Zingiber rubens* Roxb. was used as an ingredient in a traditional "YaaHom" (fragrant medicine) used in Sukothai and Pitsanulok.

From a literature survey of plants in this genus , it was found that they are very interesting and useful in many way, especially the three important species (*Z.officinale* Rosc., *Z. zerumbet* Smith. and *Z. cassumunar* Roxb.). *Zingiber ruben* Roxb is a member of this genus, which has closely related chemotaxonomy and it is belived to possess medical value, but has not been studied it. Thus, it is the aim of this project to study the chemical constituents. This hopefully will provide more information about plants in this genus.

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1.1 Botanical Description of *Zingiber rubens* Roxb. [2,5]

Zingiber rubens Roxb. (Mayee or Khing-hang) is a plant in the Zingiberaceae family, in the Zingiber genus, its scientific name is *Zingiber rubens* Roxb. and its common name is Mayee (Mae Hong Son), Khing-Hang (Rayong). It resembles Wan, Phai, Ginger and Ka-thue.

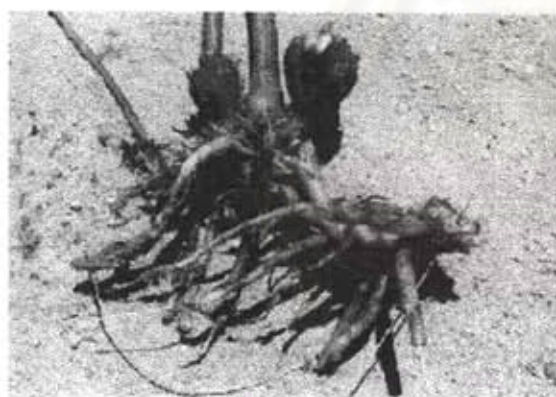
The plant is a perennial herb having horizontal creeping underground rhizomes which are white or pale-yellow inside and has a leafy stem rising up to 100-150 cm. Leaves are simple; ovate-oblong having apex acuminate; base narrowing and clasping the stem by their long sheath. Flowers are white or pale-yellow, each subtended bract and calyx red, corolla tube yellowish, lobes reddish, staminodes with maroon blots on yellow lip similar but lighter yellow (Fig.1).

Ecology and Distribution [4,5]

The plants are found in shaded evergreen forests. They require fertile clay soil with sand, good drainage and moderate sunlight. They are also cultivated throughout tropical Asia and they are propagated by rhizomes.

1.2 Chemical constituents of *Zingiber* genus

A literature surveys of plants belonging to the *Zingiber* genus revealed that many organic compounds have been isolated. The various types of organic substances reported are shown in Table 1 and some of their structures in Fig.2.



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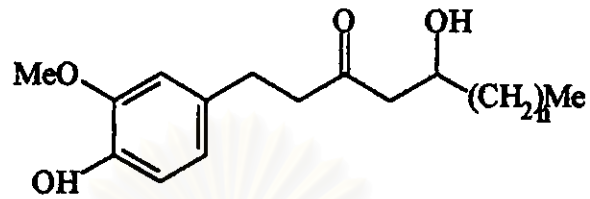
Figure 1 *Zingiber rubens* Roxb.

Table 1 The chemical constituents of some plants in Zingiber genus

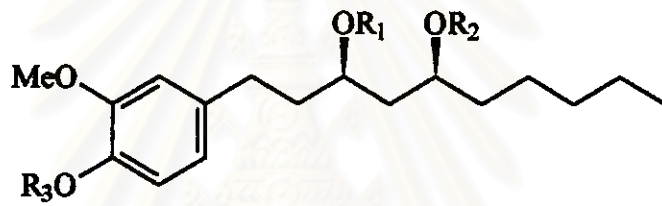
Scientific Name (common name)	Plant parts	Chemical compound	Ref.		
<i>Zingiber officinale</i> Rosc. (Khing)	Rhizome	4,6,8-gingerol (1)	6		
		3,5-dihydroxy-1-(4-hydroxy-3-methoxyphenyl)decane (2)	7		
		3,5-diacetoxy-1-(3,4-dimethoxyphenyl)decane (3)	8		
		5-hydroxy-7-(4-hydroxyphenyl)-1-(4-hydroxy-3-methoxyphenyl)-3-heptanone (4)			
		3,5-dihydroxy-1,7-bis(3,4-hydroxy-3-methoxyphenyl)heptane (5)			
		3,5-diacetoxy-1,7-bis(3,4-dihydroxyphenyl)heptane (6)			
		gingerenone A,B,C (7,8,9)	9		
		<i>Zingiber cassumunar</i> Roxb. (Phlai)	Rhizome	cassumunin A,B,C (10,11,12)	10
				4-(3',4'-dimethoxyphenyl)but-1,3-diene (13)	11
4-(2',4',5'-trimethoxyphenyl)but-1,3-dien (14)					
3,4-dimethoxybenzaldehyde (15)					
2,4,5-trimethoxybenzaldehyde (16)					
<i>cis</i> -3-(3,4-dimethoxyphenyl)-4-[(<i>E</i>)-2,4,5-trimethoxystyryl]cyclohex-1-ene (17)	12				

Table 1 (cont.)

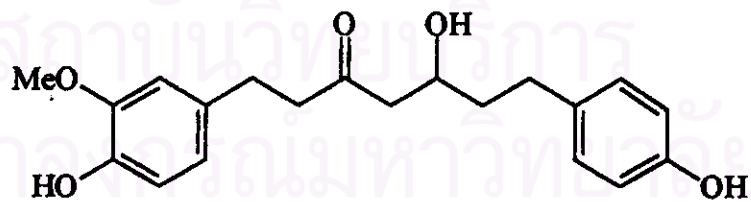
Scientific Name (common name)	Plant parts	Chemical compound	Ref.
<i>Zingiber cassumunar</i> Roxb. (Phlai)	Rhizome	<i>cis</i> -3-(2,3,4-trimethoxyphenyl)-4-[(<i>E</i>)-2,4,5-trimethoxystyryl]cyclohex-1-ene (18)	12
		8-(3,4-dimethoxyphenyl)-2-methoxynaphtho-1,4-quinone (19)	
		2-methoxy-8-(2,4,5-trimethoxyphenyl)naphtho-1,4-quinone (20)	
		1-(3,4-dimethoxyphenyl)butadiene (21)	
		cassumunarin A,B,C (22,23,24)	13
		1,2-bis(3,4-dimethoxystyryl)cyclobutane(25)	14
<i>Zingiber zerumbet</i> Smith. (Ka-thue)	Rhizome	kaempferol-3- <i>O</i> -(2- <i>O</i> -acetyl- α -L-rhamnopyranoside (26)	15
		kaempferol-3- <i>O</i> -(4- <i>O</i> -acetyl- α -L-rhamnopyranoside (27)	
		kaempferol-3- <i>O</i> -(2,4- <i>O</i> -diacetyl- α -L-rhamnopyranoside (28)	
		kaempferol-3,4'- <i>O</i> -dimethylether (29)	16
		kaempferol-3- <i>O</i> -methylether (30)	
		curcumin (31)	17
		demethoxycurcumin (32)	
		bisdemethoxycurcumin (33)	



1

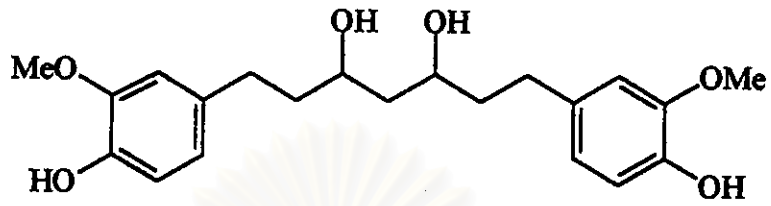


	R ₁	R ₂	R ₃
2.	H	H	H
3.	Ac	Ac	Me

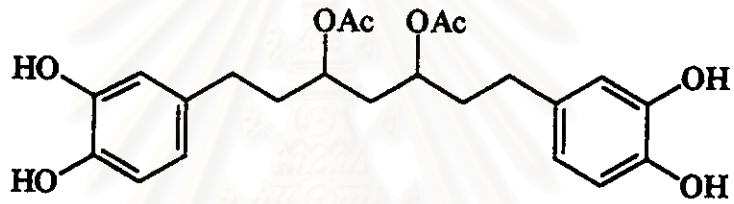


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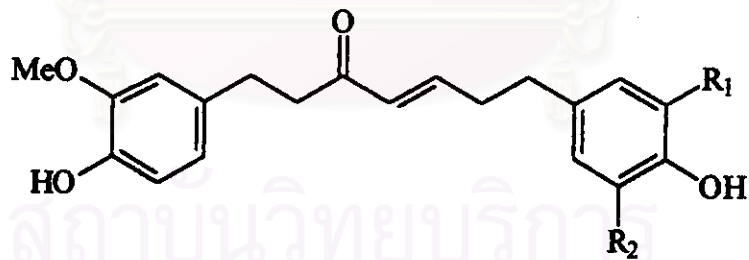
Figure 2 Chemical constituents of *Zingiber officinale* Rosc.



5



6



	R ₁	R ₂
7.	OMe	H
8.	OMe,	OMe
9.	H	H

Figure 2 (cont.) Chemical constituents of *Zingiber officinale* Rosc.

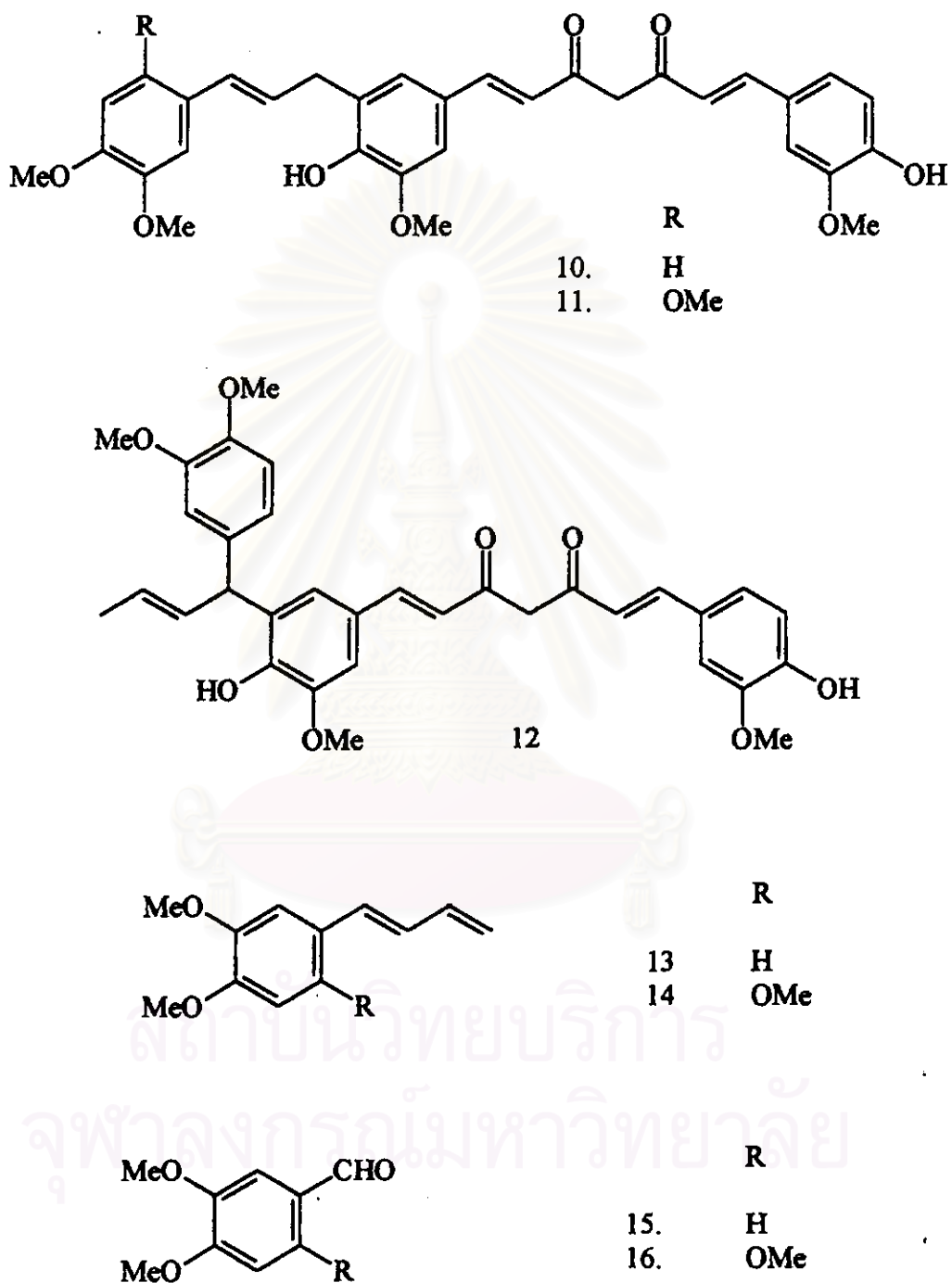


Figure 2 (cont.) Chemical constituents of *Zingiber cassumunar* Roxb.

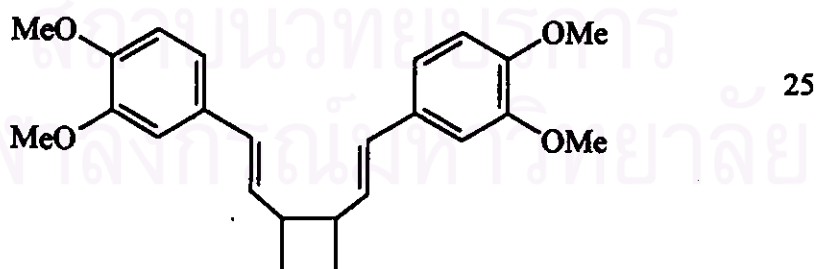
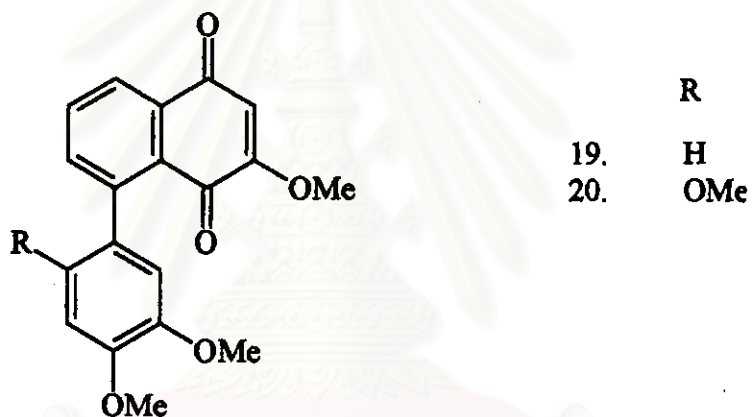
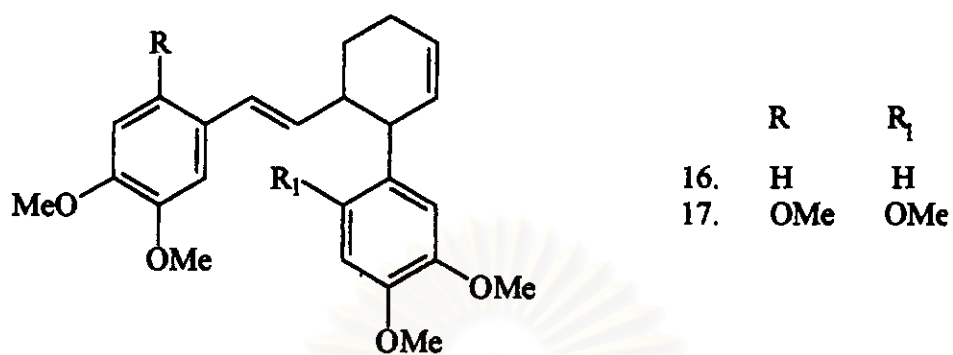


figure 2 (cont.) Chemical constituents of *Zingiber cassumunar* Roxb.

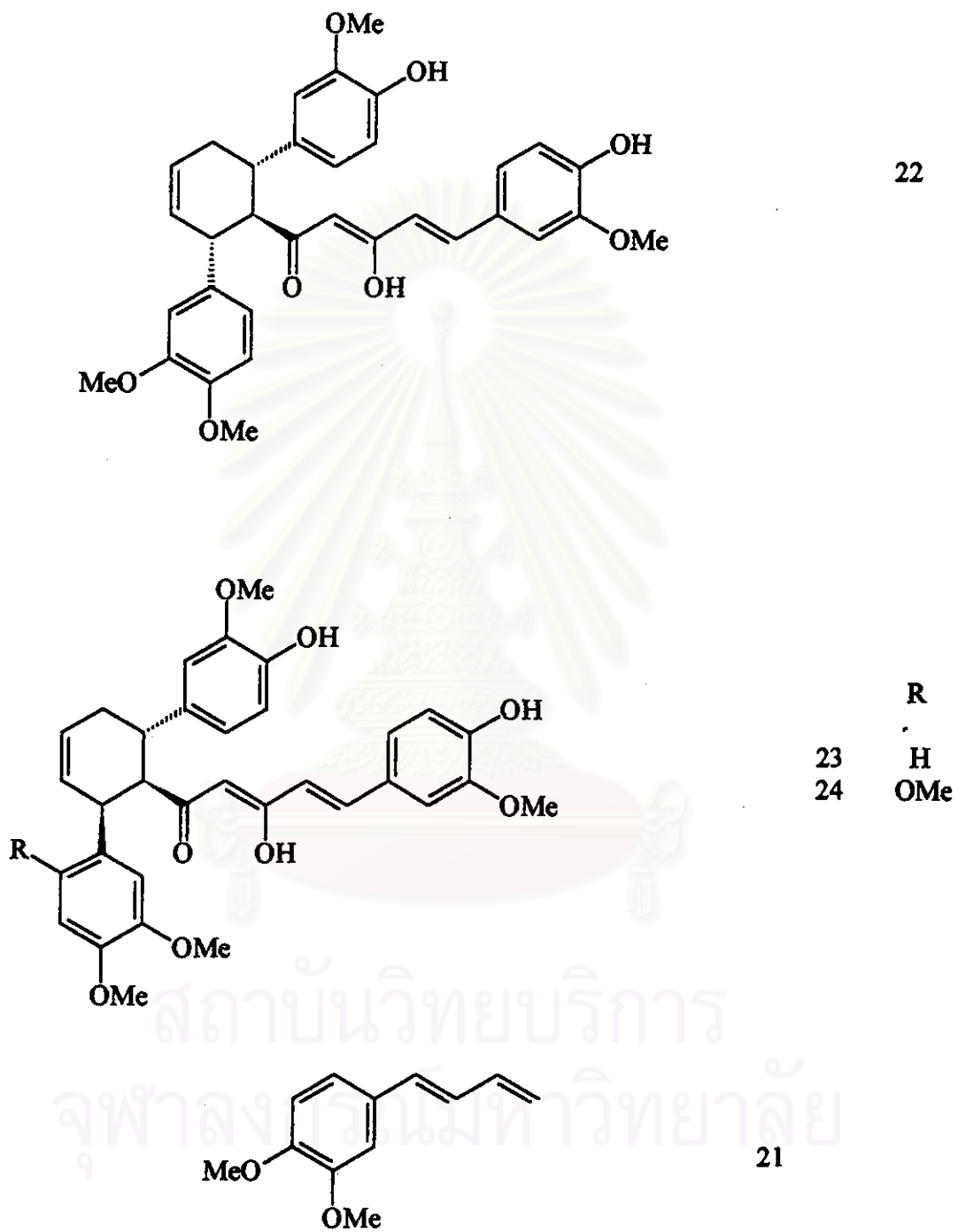
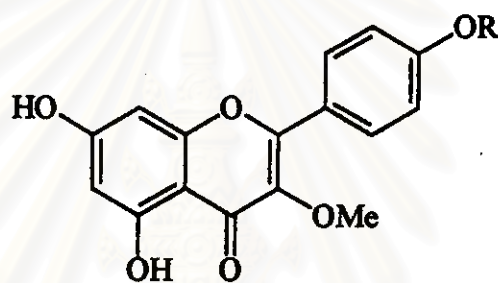
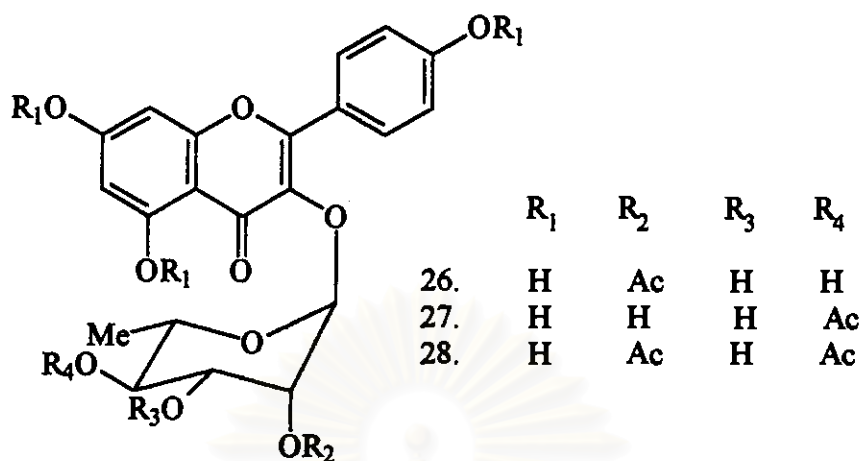
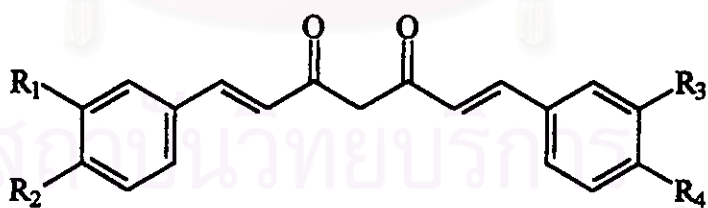


Figure 2 (cont.) Chemical constituents of *Zingiber cassumunar* Roxb.



R

29.	Me
30.	H



	R ₁	R ₂	R ₃	R ₄
31.	OMe	OH	OMe	OH
32.	OMe	OH	H	OH
33.	H	OH	H	OH

Figure 2 (cont.) Chemical constituents of *Zingiber zerumbet* Smith.

1.3 Pharmacological activities [4]

The report on pharmacological activities and clinical trials of some of the members of the *Zingiber* genus are summarized in Table 2.

Table 2 The Pharmacological activities of some plants in *Zingiber* genus

Scientific Name	Plant parts	Activities
<i>Zingiber officinale</i> Rosc.	Rhizome	Antihypercholesterol Narcotic antagonist Analgesic and antipyretic Antibacterial Cytotoxic Mutagenic Antiinflammatory Insecticidal
<i>Zingiber cassumunar</i> Roxb.	Rhizome	Smooth muscle relaxation Antiasthmatic Hypotensive Local anesthetic Antibacterial Mutagenic Antiinflammatory Toxic

Table 2 (cont.)

Scientific Name	Plant parts	Activities
Zingiber zerumbet Smith.	Rhizome	Cytotoxic Anthelmintic Antibacterial Mutagenic Antimalarial

The objectives of this research

The objectives of this research can be summarized as follows:

1. To isolate chemical constituents from the essential oil from the rhizomes of *Zingiber ruben* Roxb.
2. To extract and isolate the chemical constituents from the rhizomes of *Zingiber rubens* Roxb.
3. To identify the constituents of the isolated compounds.
4. To add chemical information on the plants in genus Zingiber.

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