CHAPTER IV

CONCLUSION

From this research, the chemical constituents of crude lipid from both filter cakes of 4 refined sugar factories and sugar cane rinds of 3 different varieties were summarized as follows:

4.1 Filter Cake

The crude lipids (hexane extract) from filter cakes varied from 5.3 to 17.8%. Five substances were isolated from the crude lipids and they were elucidated as a mixture of saturated long chain aliphatic alcohols ($C_{25}H_{51}OH$ - $C_{35}H_{71}OH$) 27.5-31.7%, a mixture of saturated long chain aliphatic carboxylic acids ($C_{21}H_{43}COOH$ - $C_{33}H_{67}COOH$) 0.7-5.2%, a mixture of B-sitosterol; campesterol; and stigmaterol 0.1-2.7%, a mixture of saturated long chain aliphatic aldehydes ($C_{22}H_{45}CHO$ - $C_{33}H_{67}CHO$) 0.0-2.4%, and a mixture of saturated long chain aliphatic hydrocarbons ($C_{25}H_{52}$ - $C_{35}H_{72}$) 0.2-1.1%. The mixture of saturated long chain aliphatic alcohols was the major component of the 5 substances and triacontanol ($C_{30}H_{61}OH$) was the major component of this major substance. Stigmasterol was the major composition in the mixture of steriodal compounds and octacosanoic acid ($C_{27}H_{55}COOH$) was the major component in the mixture of saturated long chain aliphatic carboxylic acids. The mixture of saturated

long chain aliphatic aldehydes were only isolated from Mitr Phol's, Khumphawapi's, and United Farmer&Industry's filter cake.

4.2 Sugar Cane Rind

The crude lipids extracted from sugar cane rinds were 10.9-20.8%. The comparative study of three sugar cane varieties (F147, F153, and Q83) showed that the lipid content of F153 variety was nearly two times more than the lipid content of both F147 and Q83 variety. There were 4 substances isolated from the lipid which elucidated as a mixture of saturated long chain aliphatic hydrocarbons ($C_{24}H_{50}$-$C_{35}H_{72}$) 0.02-1.0%, a mixture of long chain aliphatic aldehydes ($C_{21}H_{43}CHO$-$C_{33}H_{67}CHO$) 2.6-23.3%, a mixture of long chain aliphatic alcohols ($C_{24}H_{49}OH$-$C_{35}H_{71}OH$) 30.3-46.3%, and a mixture of long chain aliphatic carboxylic acids ($C_{23}H_{47}COOH$-$C_{33}H_{67}COOH$) 1.0-15.0%. The mixture of long chain aliphatic alcohols was the major component of all three varieties. In F153 and Q83 variety, the second moajor component was the mixture of long chain aliphatic aldehydes, while the mixture of long chain aliphatic carboxylic acids was the second major component in F147 variety. The mixture of saturated long chain aliphatic hydrocarbons was trace. Further more, it was found that steroidal substance appeared in the lipid, but it was so little that it could not be identified any further.

From the crude chloroform extract of sugar cane rind, there were three substances isolated. Two substances were elucidated as a mixture of saturated long chain aliphatic alcohols ($C_{26}H_{53}OH$-$C_{32}H_{65}OH$) and kojic acid (only found in F147

and F153 variety). The other one was an unidentified compound (m.p. 274-276°C). Kojic acid was reported as a component in sugar cane for the first time in this experiment.

The compositions of various compounds in filter cake and sugar cane rind are shown in Table 4.1 and 4.2.

From the results of extraction, the crude lipids were extracted from sugar cane rinds more than from filter cakes. Because filter cake is the waste from refined sugar factory and it is too much both time and money to obtain sugar cane rinds, the extraction of crude lipid from filter cake will be more useful than from sugar cane rind if we find an appropiated method of extraction.

Table 4.1 The chemical constituents of various sugar cane rinds

Substances	Compositions of substance					
	F147		F153		Q83	
	%yield	components	%yield	components	%yield	components
the mixture of saturated long chain aliphatic hydrocarbons	1.0	C_{25}-C_{27}^{*}-C_{35}	0.4	C_{25}-C_{27}^{*}-C_{35}	0.9	C_{25}-C_{27}^{*}-C_{35}
the mixture of saturated long chain aliphatic aldehydes	2.6	C_{28}^{*}, $C_{30,32}$, C_{34}	23.3	C_{23}, C_{25}^{*}, C_{27}-C_{31}	6.2	C_{25}-C_{28}^{*}-C_{30} $C_{32,34}$
the mixture of steroids	trace	unidentified	trace	unidentified	trace	unidentified
the mixture of saturated long chain aliphatic alcohols	46.3	C_{25}-C_{30}^{*}-C_{35}	30.3	C_{26}-C_{30}^{*}-C_{33}, C_{35}	41.1	C_{26}-C_{30}^{*}-C_{32}
the mixture of saturated long chain aliphatic carboxylic acids	15.0	C_{26}-C_{28}^{*}, C_{30}-C_{34}	1.0	C_{22}-C_{28}^{*}-C_{34}	1.9	C_{26}-C_{28}^{*}, C_{30}-C_{34}
kojic acid	0.4		0.1		-	

* the major composition of each substance

Table 4.2 The chemical constituents of various filter cakes

Substances	Compositions of substance							
	Mitr Phol		Mitr Siam		Khumphawapi		United Farmer& Industry	
	%yield	components	%yield	components	%yield	components	%yield	components
the mixture of saturated long chain aliphatic hydrocarbons	0.2	C_{25}-C^{*}_{33}-C_{35}	0.3	C_{25}-C^{*}_{33}-C_{35}	0.5	C_{25}-C^{*}_{33}-C_{35}	1.1	C_{24}-C^{*}_{27}-C_{35}
the mixture of saturated long chain aliphatic aldehydes	2.4	$C_{24,25,27,34}$, C^{*}_{28}, C_{30-32}	-	-	0.7	C_{22}-C^{*}_{29}	0.1	C_{23}-C^{*}_{25}, C_{31} C_{27}-C_{29}, C_{33}
the mixture of steroids	0.1	campesterol β-sitosterol stigmasterol*	2.7	campesterol β-sitosterol stigmasterol*	0.3	campesterol β-sitosterol stigmasterol*	0.8	campesterol β-sitosterol stigmasterol*
the mixture of saturated long chain aliphatic alcohols	31.2	C_{26}-C^{*}_{30}-C_{35}	27.5	C_{26}-C^{*}_{30}-C_{35}	31.7	C_{27}-C^{*}_{30}, C_{32} C_{34}	29.3	C_{26}-C^{*}_{30}-C_{35}
the mixture of saturated long chain aliphatic carboxylic acids	0.7	C_{24}-C^{*}_{28}-C_{32} C_{34}	5.2	C_{24}-C^{*}_{28}-C_{34}	4.5	C_{26}-C^{*}_{28}-C_{30}, $C_{32,34}$	2.8	C_{24}-C^{*}_{28}, C_{30} C_{32}, C_{34}

* the major composition of each substance

4.3 Biological Activity and Utilization of Isolated Substances

4.3.1 Substance 1

Substance 1 was a trace substance isolated from filter cakes and sugar cane rinds and it was elucidated its structure as a mixture of saturated long chain aliphatic hydrocarbons (C_{24}-C_{35}). It may have the biological activity similar to long chain hydrocarbons (C_{27}-C_{33}) from the leaves of R. apiculata Bl. which was found that it showed the antigrowth activity against the fungi Pythium ultimum and Helminthosporium teres (%T/C 120 and 12, respectively) (55).

4.3.2 Substance 2

Substance 2 was separated from filter cakes and sugar cane rinds and elucidated its structure as a mixture of saturated long chain aliphatic aldehydes (C_{22}-C_{34}). From a Japaness patent (56), it was reported that $C_{23}H_{51}CHO$, $C_{27}H_{55}CHO$, and $C_{29}H_{59}CHO$ showed anticholestermic activity. Thus substance 2 should have the same biological activity as the compounds in this patent.

4.3.3 Substance 3

Substance 3 was separated from both filter cakes and sugar cane rinds. The substance isolated from filter cakes was identified as a mixture of β-sitosterol, stigmasterol, and campesterol. These co-occurrence of three steroids are widely distributed in the plant kingdom. The plant steroids were well known to be used as precursors for preparing steroid hormones. For example, stigmasterol had been reported to be used as precursors to synthesize progesterone hormone (57). Sitosterol

is proposed for treatment of hypercholesterolemia (58). Moreover, the mixture of steroids displayed the antifeedant activity (56).

4.3.4 Substance 4 and Substance 6

Substance 4 was separated and elucidated its structure as a mixture of saturated long chain aliphatic primary alcohols (C_{25}-C_{35}), while substance 6 was isolated and identified as a mixture of long chain alcohols (C_{26}-C_{32}). The triacontanol ($C_{30}H_{61}OH$) had been reported to be widely used as a plant growth regulator (PGR). 10-20 mg/L of triacontanol was used as the plant growth stimulating agent on tomato plants (55).

4.3.5 Compound 8

Compound 8 was isolated from sugar cane rinds of F147 and F153 varieties and identified as kojic acid (5-hydroxy-2-(hydroxymethyl)-4-pyrone). Kojic acid and its derivatives are the compounds used in phamaceutical and cosmetic industries. They are useful for the prevention of elatosis (59) and effective in preventing UV-induced suntan and sunburn (60,61,62,63). Kojic acid derivatives are prepared as proteinase inhibitors for prevention or treatment of elastase-mediated diseases such as inflammatory connective tissue disease (64). Moreover, kojic acid is used for the preservatiion of fresh foods (e.g. fresh shiitake mushroom) by the dipping or spraying method (65).