



Extraction Hydrocarbon From Mangosteen Peels

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Abstract

Mangosteen is a tropical fruit known for its rich phytochemical composition, including hydrocarbons that possess various interesting properties. This study focuses on extraction hydrocarbons from mangosteen peels by gas chromatography-mass spectrometry (GC-MS) to identify the specific compounds present. The peel of the mangosteen fruit contains several beneficial compounds such as xanthenes, tannins, and antioxidants. These compounds are believed to possess anti-inflammatory, antibacterial, and antioxidant properties, which can support overall health.

Keywords: NIL

Introduction

Thailand is one of the major producers of mangosteen, and the country's warm and humid climate. The eastern regions of Thailand such as Trat, Chanthaburi, and Rayong, are particularly known for their high-quality mangosteen. The mangosteen fruit has a dark purple rind and a sweet, tangy, and juicy white flesh inside. It is often referred to as the "queen of fruits" due to its exquisite flavor. Mangosteen is typically eaten fresh, and the best way to enjoy it is by cutting open the thick rind and consuming the segments inside.

Objective

Extraction hydrocarbon from the peel of the mangosteen which contains several beneficial compounds such as xanthenes, tannins, and

antioxidants. These compounds are believed to possess anti-inflammatory, antibacterial, and antioxidant properties, which can support overall health.

Methodology

Extraction hydrocarbon from mangosteen by Gas chromatography (GC) by 3 different solvent : White spirit, Ethanol and Ethly acetate to test the solubility. To see which type of solvent can extract the number of hydrocarbon from peels

1. Wash the mangosteen peel with water and put in the sun to dry about 7 days
2. Take the sun-dried peel and grind it into coarse and fine grinding



3. Prepare 3 types of solutions : White spirit, Ethanol และ Ethyl acetate



4. Take 10 grams each of both coarse and fine mangosteen peels and put into 6 flasks for coarse and 6 flasks for fine grinding



5. Put 50 ml of 3 types solvent into the flask mangosteen peel :

Coarse peel : Ethanol 2 flasks , Ethyl acetate 2 flasks and Ethanol 2 flasks

Fine peel : Ethanol 2 flasks , Ethyl acetate 2 flasks and Ethanol 2 flasks



6. Bring the sample onto the rotation machine 200 times per minutes which different time duration 30 minutes and 75 minutes



Fine flask	Coarse flask
Ethanol 30 mins	Ethanol 30 mins
Ethanol 75 mins	Ethanol 75 mins
Ethyl acetate 30 mins	Ethyl acetate 30 mins
Ethyl acetate 75 mins	Ethyl acetate 75 mins
White spirit 30 mins	White spirit 30 mins
White spirit 30 mins	White spirit 30 mins

7. Filtrate all flasks with filter paper 1.036 g



8. Bring the filtered substance to the gas chromatography to extract hydrocarbon

Results Composition and Identification of Extracted Hydrocarbons

Ethyl acetate :

Coarse : Ethyl acetate 30 mins	Coarse : Ethyl acetate 75 mins	Fine : Ethyl acetate 30 mins	Fine : Ethyl acetate 75 mins
Trichloroethylene	Trichloroethylene	Trichloroethylene	Trichloroethylene
Propanoic acid, ethyl ester	Propanoic acid, ethyl ester	Propanoic acid, ethyl ester	Propanoic acid, ethyl ester
n-Propyl acetate			
Formic acid, butyl ester	Formic acid, butyl ester	Formic acid, butyl ester	Formic acid, butyl ester
sec-Butyl acetate	sec-Butyl acetate	sec-Butyl acetate	sec-Butyl acetate
Toluene	Toluene	Toluene	Toluene
Butanoic acid, ethyl ester	Butanoic acid, ethyl ester	Butanoic acid, ethyl ester	Butanoic acid, ethyl ester
Acetic acid, butyl ester	Acetic acid, butyl ester	Acetic acid, butyl ester	Acetic acid, butyl ester
2,4-Heptadiene, 2,6-dimethyl-	2,4-Heptadiene, 2,6-dimethyl-	2,4-Heptadiene, 2,4-dimethyl-	2,4-Heptadiene, 2,6-dimethyl-
			Benzene, bromo-
			Hexanoic acid
			Phenol
Aniline			
Decane	Decane	Decane	Decane
			Benzyl alcohol
Acetic acid, hexyl ester			
Benzaldehyde, 2-hydroxy-			Benzaldehyde, 2-hydroxy-
Ethanol, 1-(2-butoxyethoxy)-	Ethanol, 1-(2-butoxyethoxy)-		
		Nonanal	Nonanal
			Phenylethyl Alcohol
			3,4-Dihydroxy-5-methyl-dihydrofuran-2-one
		Ethanol, 1-(2-butoxyethoxy)-	Ethanol, 1-(2-butoxyethoxy)-
Dodecane	Dodecane	Dodecane	Dodecane
			Acetic acid, 2-phenylethyl ester
.alfa.-Copaene	.alfa.-Copaene	.alfa.-Copaene	.alfa.-Copaene
Tetradecane	Tetradecane	Tetradecane	Tetradecane
Caryophyllene	Caryophyllene	Caryophyllene	Caryophyllene
Aromandrene			
	1H-Cycloprop[e]azulene, 1a,2,3,5,6,7,7a,7b-octahydro-1,1,4,7-tetramethyl-, [1aR-(1a.alpha.,7.alpha.,7a.beta.,7b.alpha.)]-	1H-Cycloprop[e]azulene, 1a,2,3,5,6,7,7a,7b-octahydro-1,1,4,7-tetramethyl-, [1aR-(1a.alpha.,7.alpha.,7a.beta.,7b.alpha.)]-	1H-Cycloprop[e]azulene, 1a,2,3,5,6,7,7a,7b-octahydro-1,1,4,7-tetramethyl-, [1aR-(1a.alpha.,7.alpha.,7a.beta.,7b.alpha.)]-
Humulene	Humulene	Humulene	
		.alpha.-acorenol	.alpha.-acorenol
Naphthalene, 1,2,4a,5,8,8a-hexahydro-4,7-dimethyl-1-(1-methylethyl)-, [1S-(1.alpha.,4a.beta.,8a.alpha.)]-	Naphthalene, 1,2,4a,5,8,8a-hexahydro-4,7-dimethyl-1-(1-methylethyl)-, [1S-(1.alpha.,4a.beta.,8a.alpha.)]-	Naphthalene, 1,2,4a,5,8,8a-hexahydro-4,7-dimethyl-1-(1-methylethyl)-, [1S-(1.alpha.,4a.beta.,8a.alpha.)]-	Naphthalene, 1,2,4a,5,8,8a-hexahydro-4,7-dimethyl-1-(1-methylethyl)-, [1S-(1.alpha.,4a.beta.,8a.alpha.)]-
.gamma.-Muurolene	.gamma.-Muurolene	.gamma.-Muurolene	.gamma.-Muurolene
Naphthalene, decahydro-4a-methyl-1-methylene-7-(1-methylethyl)-, [4aR-(4a.alpha.,7.alpha.,8a.beta.)]-	Naphthalene, decahydro-4a-methyl-1-methylene-7-(1-methylethyl)-, [4aR-(4a.alpha.,7.alpha.,8a.beta.)]-	Naphthalene, decahydro-4a-methyl-1-methylene-7-(1-methylethyl)-, [4aR-(4a.alpha.,7.alpha.,8a.beta.)]-	Naphthalene, decahydro-4a-methyl-1-methylene-7-(1-methylethyl)-, [4aR-(4a.alpha.,7.alpha.,8a.beta.)]-

Coarse : Ethly acatate 30 mins	Coarse : Ethly acatate 75 mins	Fine : Ethly acatate 30 mins	Fine : Ethly acatate 75 mins
Naphthalene, 1,2,3,5,6,7,8,8a-octahydro-1,8a-dimethyl-7-(1-methylethyl)-, [1R-(1.alpha.,7.beta.,8a.alpha.)]-	Naphthalene, decahydro-4a-methyl-1-methylene-7-(1-methylethyl)-, [4aR-(4.alpha.,7.alpha.,8a.beta.)]-	Naphthalene, 1,2,3,5,6,7,8,8a-octahydro-1,8a-dimethyl-7-(1-methylethyl)-, [1R-(1.alpha.,7.beta.,8a.alpha.)]-	Naphthalene, 1,2,3,5,6,7,8,8a-octahydro-1,8a-dimethyl-7-(1-methylethyl)-, [1R-(1.alpha.,7.beta.,8a.alpha.)]-
Guaia-3,9-diene	Guaia-3,9-diene	Guaia-3,9-diene	Guaia-3,9-diene
Naphthalene, decahydro-4a-methyl-1-methylene-7-(1-methylethylidene)-, (4aR-trans)-	Naphthalene, decahydro-4a-methyl-1-methylene-7-(1-methylethylidene)-, (4aR-trans)-	Naphthalene, decahydro-4a-methyl-1-methylene-7-(1-methylethylidene)-, (4aR-trans)-	Naphthalene, decahydro-4a-methyl-1-methylene-7-(1-methylethylidene)-, (4aR-trans)-
	1,1,4a-Trimethyl-5,6-dimethylenedecahydronaphthalene	1,1,4a-Trimethyl-5,6-dimethylenedecahydronaphthalene	
Selina-3,7(11)-diene	Selina-3,7(11)-diene	Selina-3,7(11)-diene	Selina-3,7(11)-diene
Epizonarene	Epizonarene	Epizonarene	Epizonarene
.alpha.-Calacorene	.alpha.-Calacorene	.alpha.-Calacorene	.alpha.-Calacorene
		1,3,5-Benzenetriol	1,3,5-Benzenetriol
Hexadecane	Hexadecane	Hexadecane	Hexadecane
.alpha.-acorenol	.alpha.-acorenol	.alpha.-acorenol	.alpha.-acorenol
.alpha.-Cadinol	.alpha.-Cadinol		
1-Naphthalenol, 1,2,3,4,4a,7,8,8a-octahydro-1,6-dimethyl-4-(1-methylethyl)-, [1S-(1.alpha.,4.alpha.,4a.beta.,8a.b.eta.)]-			
		Homovanillic acid	Homovanillic acid
			Cubanol
Naphthalene, 1,6-dimethyl-4-(1-methylethyl)-		Naphthalene, 1,6-dimethyl-4-(1-methylethyl)-	
4-((1E)-3-Hydroxy-1-propenyl)-2-methoxyphenol	4-((1E)-3-Hydroxy-1-propenyl)-2-methoxyphenol	4-((1E)-3-Hydroxy-1-propenyl)-2-methoxyphenol	4-((1E)-3-Hydroxy-1-propenyl)-2-methoxyphenol
Octadecane	Octadecane	Octadecane	Octadecane
5-Octadecenal			
		Z-8-Methyl-9-tetradecenoic acid	Z-8-Methyl-9-tetradecenoic acid
3,5-Dimethoxy-4-hydroxyphenylacetic acid	3,5-Dimethoxy-4-hydroxyphenylacetic acid	3,5-Dimethoxy-4-hydroxyphenylacetic acid	3,5-Dimethoxy-4-hydroxyphenylacetic acid
			Heptadecane, 3-methyl-
		n-Hexadecanoic acid	n-Hexadecanoic acid
Dibutyl phthalate	Dibutyl phthalate	Dibutyl phthalate	Dibutyl phthalate
Eicosane	Eicosane	Eicosane	Eicosane
Docosane	Docosane	Docosane	Docosane
Tetracosane		Tetracosane	Tetracosane
		Heptacosane	Heptacosane
		Nonacosane	Nonacosane
			Dibenzo[c,e]cyclohepten, 2,3,9-trimethoxy-
4,5,6,7-Tetrahydroxy-1,8,8,9-tetramethyl-8,9-dihydrophenaleno[1,2-b]furan-3-one	4,5,6,7-Tetrahydroxy-1,8,8,9-tetramethyl-8,9-dihydrophenaleno[1,2-b]furan-3-one	4,5,6,7-Tetrahydroxy-1,8,8,9-tetramethyl-8,9-dihydrophenaleno[1,2-b]furan-3-one	4,5,6,7-Tetrahydroxy-1,8,8,9-tetramethyl-8,9-dihydrophenaleno[1,2-b]furan-3-one
4H-1-Benzopyran-4-one, 8-.beta.-D-glucopyranosyl-5,7-dihydroxy-2-(4-hydroxyphenyl)-	4H-1-Benzopyran-4-one, 8-.beta.-D-glucopyranosyl-5,7-dihydroxy-2-(4-hydroxyphenyl)-		
		Stigmasterol	Stigmasterol
	Dihydrofuro[2,3-e]phenalene, 6-methoxy-8-oxo-2,3,3,10-tetramethyl-4,5,7-trihydroxy-	Dihydrofuro[2,3-e]phenalene, 6-methoxy-8-oxo-2,3,3,10-tetramethyl-4,5,7-trihydroxy-	Dihydrofuro[2,3-e]phenalene, 6-methoxy-8-oxo-2,3,3,10-tetramethyl-4,5,7-trihydroxy-
	2,5-Cyclohexadien-1-one, 4-[3,5-bis(1,1-dimethylethyl)-4-oxo-2,5-cyclohexadien-1-ylidene]-2,6-bis(1,1-dimethylethyl)-	2,5-Cyclohexadien-1-one, 4-[3,5-bis(1,1-dimethylethyl)-4-oxo-2,5-cyclohexadien-1-ylidene]-2,6-bis(1,1-dimethylethyl)-	
	17.beta.-Acetoxy-1',1'-dicarboethoxy-1.beta.,2.beta.-dihydro-17.alpha.-methyl-3'H-cycloprop[1,2]-5.alpha.-androst-1-en-3-one		
2H,5H-Benzo[1,2-b:5,4-b']dipyran-5-one, 10-(3,3-diphenyl-2-propenylidene)-3,4,6,7,8,10-hexahydro-2,2,8,8-tetramethyl-	2H,5H-Benzo[1,2-b:5,4-b']dipyran-5-one, 10-(3,3-diphenyl-2-propenylidene)-3,4,6,7,8,10-hexahydro-2,2,8,8-tetramethyl-	2H,5H-Benzo[1,2-b:5,4-b']dipyran-5-one, 10-(3,3-diphenyl-2-propenylidene)-3,4,6,7,8,10-hexahydro-2,2,8,8-tetramethyl-	2H,5H-Benzo[1,2-b:5,4-b']dipyran-5-one, 10-(3,3-diphenyl-2-propenylidene)-3,4,6,7,8,10-hexahydro-2,2,8,8-tetramethyl-
9,10-Anthracenedione, 2-[4-(acetyloxy)tetrahydro-2H-pyran-2-yl]-1,3,6,8-tetramethoxy-, cis-	9,10-Anthracenedione, 2-[4-(acetyloxy)tetrahydro-2H-pyran-2-yl]-1,3,6,8-tetramethoxy-, cis-	9,10-Anthracenedione, 2-[4-(acetyloxy)tetrahydro-2H-pyran-2-yl]-1,3,6,8-tetramethoxy-, cis-	9,10-Anthracenedione, 2-[4-(acetyloxy)tetrahydro-2H-pyran-2-yl]-1,3,6,8-tetramethoxy-, cis-
Anthra[2,3-b]furo[3,2-d]furan-5,10-dione, 2,3,3a,12a-tetrahydro-6-hydroxy-4,8-dimethoxy-, cis(-)-		Anthra[2,3-b]furo[3,2-d]furan-5,10-dione, 2,3,3a,12a-tetrahydro-6-hydroxy-4,8-dimethoxy-, cis(-)-	

Ethanol :

Coarse : Ethanol 30 mins	Coarse : Ethanol 75 mins	Fine : Ethanol 30 mins	Fine : Ethanol 75 mins
Furfural	Furfural	Furfural	
	trans-Decalin, 2-methyl-		
	Undecane, 4-methyl-		
	Undecane, 2-methyl-		
	Undecane, 3-methyl-		
		4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-	
Benzoic acid		Benzoic acid	
Dodecane	Dodecane	Dodecane	
	Undecane, 2,5-dimethyl-		
	Cyclohexane, 2-butyl-1,1,3-trimethyl-		
	Dodecane, 2-methyl-		
	Dodecane, 2-methyl-		
	Undecane, 6-ethyl-		
	Dodecane, 4,6-dimethyl-		
5-Hydroxymethylfurfural		5-Hydroxymethylfurfural	
	Tridecane		Tridecane
Copaene		Copaene	
	2,3-Dimethyldodecane		
	Tridecane, 2-methyl-		
	Tridecane, 3-methyl-		
	Dodecane, 2,6,10-trimethyl-		
	Copaene		
Tetradecane	Tetradecane	Tetradecane	Tetradecane
Caryophyllene	Caryophyllene	Caryophyllene	
	Pentadecane		Pentadecane
	8-epi-.gamma.-eudesmol		

Coarse : Ethanol 30 mins	Coarse : Ethanol 75 mins	Fine : Ethanol 30 mins	Fine : Ethanol 75 mins
Naphthalene, 1,2,4a,5,8,8a-hexahydro-4,7-dimethyl-1-(1-methylethyl)-, [1S-(1.alpha.,4a.beta.,8a.alpha.)]-		Naphthalene, 1,2,4a,5,8,8a-hexahydro-4,7-dimethyl-1-(1-methylethyl)-, [1S-(1.alpha.,4a.beta.,8a.alpha.)]-	
		1,1,4a-Trimethyl-5,6-dimethylenedecahydronaphthalene	
.alpha.-acorenol			
Naphthalene, decahydro-4a-methyl-1-methylene-7-(1-methylethylidene)-, (4aR-trans)-		Naphthalene, decahydro-4a-methyl-1-methylene-7-(1-methylethylidene)-, (4aR-trans)-	
.alpha.-acorenol		.alpha.-acorenol	
Selina-3,7(11)-diene	Selina-3,7(11)-diene	Selina-3,7(11)-diene	
Epizonarene	Epizonarene	Epizonarene	
	Hexadecane		Hexadecane
	1,3-Benzenediol, 4-propyl-		
		Diethyl Phthalate	
1,3-Benzenediol, 4-propyl-			
4-epi-cubedol	4-epi-cubedol	4-epi-cubedol	
4-((1E)-3-Hydroxy-1-propenyl)-2-methoxyphenol	4-((1E)-3-Hydroxy-1-propenyl)-2-methoxyphenol	4-((1E)-3-Hydroxy-1-propenyl)-2-methoxyphenol	4-((1E)-3-Hydroxy-1-propenyl)-2-methoxyphenol
	Octadecane	Octadecane	
2-Hydroxy-5-methylisophthalaldehyde	2-Hydroxy-5-methylisophthalaldehyde		2-Hydroxy-5-methylisophthalaldehyde
3,5-Dimethoxy-4-hydroxyphenylacetic acid	3,5-Dimethoxy-4-hydroxyphenylacetic acid	3,5-Dimethoxy-4-hydroxyphenylacetic acid	3,5-Dimethoxy-4-hydroxyphenylacetic acid
		Lidocaine	Lidocaine
n-Hexadecanoic acid	n-Hexadecanoic acid	n-Hexadecanoic acid	n-Hexadecanoic acid
Dibutyl phthalate	Dibutyl phthalate	Dibutyl phthalate	Dibutyl phthalate
			4H-1-Benzopyran-4-one, 2-(3,4-dimethoxyphenyl)-3,7-dimethoxy-
4,5,6,7-Tetrahydroxy-1,8,8,9-tetramethyl-8,9-dihydrophenaleno[1,2-b]furan-3-one	4,5,6,7-Tetrahydroxy-1,8,8,9-tetramethyl-8,9-dihydrophenaleno[1,2-b]furan-3-one	4,5,6,7-Tetrahydroxy-1,8,8,9-tetramethyl-8,9-dihydrophenaleno[1,2-b]furan-3-one	
Dihydrofuro[2,3-e]phenalene, 6-methoxy-8-oxo-2,3,3,10-tetramethyl-4,5,7-trihydroxy-	Dihydrofuro[2,3-e]phenalene, 6-methoxy-8-oxo-2,3,3,10-tetramethyl-4,5,7-trihydroxy-	Dihydrofuro[2,3-e]phenalene, 6-methoxy-8-oxo-2,3,3,10-tetramethyl-4,5,7-trihydroxy-	Dihydrofuro[2,3-e]phenalene, 6-methoxy-8-oxo-2,3,3,10-tetramethyl-4,5,7-trihydroxy-
2,5-Cyclohexadien-1-one, 4-[3,5-bis(1,1-dimethylethyl)-4-oxo-2,5-cyclohexadien-1-ylidene]-2,6-bis(1,1-dimethylethyl)-	2,5-Cyclohexadien-1-one, 4-[3,5-bis(1,1-dimethylethyl)-4-oxo-2,5-cyclohexadien-1-ylidene]-2,6-bis(1,1-dimethylethyl)-		2,5-Cyclohexadien-1-one, 4-[3,5-bis(1,1-dimethylethyl)-4-oxo-2,5-cyclohexadien-1-ylidene]-2,6-bis(1,1-dimethylethyl)-
9,10-Anthracenedione, 2-[4-(acetyloxy)tetrahydro-2H-pyran-2-yl]-1,3,6,8-tetramethoxy-, cis-	9,10-Anthracenedione, 2-[4-(acetyloxy)tetrahydro-2H-pyran-2-yl]-1,3,6,8-tetramethoxy-, cis-	9,10-Anthracenedione, 2-[4-(acetyloxy)tetrahydro-2H-pyran-2-yl]-1,3,6,8-tetramethoxy-, cis-	9,10-Anthracenedione, 2-[4-(acetyloxy)tetrahydro-2H-pyran-2-yl]-1,3,6,8-tetramethoxy-, ds-

White spirit :

Coarse : White spirit 30 mins	Coarse : White spirit 75 mins	Fine : White spirit 30 mins	Fine : White spirit 75 mins
Toluene	Toluene	Toluene	Toluene
Ethylbenzene	Ethylbenzene	Ethylbenzene	Ethylbenzene
p-Xylene	p-Xylene	p-Xylen	p-Xylene
Ethanol, 2-butoxy-	Ethanol, 2-butoxy-	Ethanol, 2-butoxy-	Ethanol, 2-butoxy-
Tetradecane	Tetradecane	Tetradecane	Tetradecane
Hexadecane	Hexadecane	Hexadecane	Hexadecane
Heptadecane	Heptadecane	Heptadecane	Heptadecane
Octadecane	Octadecane	Octadecane	Octadecane
Dibutyl phthalate		Dibutyl phthalate	
Eicosane	Eicosane	Eicosane	Eicosane
Docosane	Docosane	Docosane	Docosane
Tetracosane	Tetracosane	Tetracosane	Tetracosane
		Heptacosane	Heptacosane
			Nonacosane
		Dihydrofuro[2,3-e]phenalene, 6-methoxy-8-oxo-2,3,3,10-tetramethyl-4,5,7-trihydroxy-	

Conclusion : comparison between solvent and rotation time

Ethyl acetate	extract 42-57 hydrocarbon substances , Good solvent for mangosteen peels. Peel size and rotation time affect number of the hydrocarbon found
Ethanol	extract 14-37 hydrocarbon substances , Peel size and rotation time affect number of the hydrocarbon found
White spirit	not appropriate for extract mangosteen peels