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APPENDIX

Table 17 Source and Collection number of turmeric cultivars obtained from different provinces in Thailand

Turmeric cultivar	Collection number	Source
T_1	Y 01128601	Amphur Nakhonthai, Phitsanulok
T_2	Y 01128602	Amphur Chawang, Nakhon Si Thamarat
T_3	Y 01128603	Amphur Kraburi, Ranong
T_4	Y 01038701	Amphur Mueang, Chiang Rai
T_5	Y 20038701	Amphur Mueang, Chiang Rai
T_6	Y 21038701	Amphur Sansai, Chiang Mai
T_7	Y 27048702	Amphur Umphang, Tak
T_8	Y 27048702 A	Amphur Umphang, Tak
T_9	Y 12058703	Amphur Mueang, Trang
T_{10}	Y 12058704	Amphur Mueang, Trang
T_{11}	Y 12058705	Amphur Mueang, Trang
T_{12}	Y 27058701	Amphur Mueang, Ratchaburi
T_{13}	Y 27058703	Amphur Mueang, Ratchaburi
T_{16}	Y 15118701	Bogor, Indonesia
T_{17}	Y 19118702	Amphur Sawi, Chumphon
T_{19}	Y 11128702	Doi Wawee, Chiang Rai
T_{20}	Y 10018801	Amphur Mueang, Phitsanulok
T_{21}	Y 14018801	Amphur Fang, Chiang Mai
T_{22}	Y 01038801	Doi Musor, Tak
T_{23}	Y 13038801	Amphur Mueang, Chaiyaphum
T_{25}	Y 13038803 A	Amphur Mueang, Loei
T_{26}	Y 15038802	Amphur Chiang Kan, Loei
T_{27}	Y 15038803	Amphur Chiang Kan, Loei
T_{28}	Y 15038804	Amphur Ban Phu, Udon Thani
T_{30}	Y 16038802	Amphur Kusuman, Sakon Nakhon
T_{31}	Y 16038803	Amphur Mueang, Nakhon Phanom
T_{32}	Y 17038802	Amphur That Phanom, Nakhon Phanom
T_{33}	Y 26038801	Amphur Mueamg, Chai Nat
T_{34}	Y 27038801	Amphur Mueang, Suphan Buri

Table 17 (continued)

Turmeric cultivar	Collection number	Source
T36	Y 06068801	Malaysia
T37	Y 17068801	Amphur Suwannaphum, Roi-Et
T38	Y 16118801	Amphur Tha-Bo, Nong Khai
T39	Y 18118802	Tambol Phuegdad, Mukda Han
T43	Y 03018902	Bangladesh
T45	Y 30018903	Nepal
T46	Y 30018904	Nepal
T47	Y 06068901	Amphur Thung Wa, Satun
T48	Y 06068902	Amphur Palian, Trang
T49	Y 06068903	Amphur Palian, Trang

Table 18 Curcuminold contents of various turmeric rhizomes cultivated in Phichit.

Turmeric Sample	Origin	Phichit experimental field			
		Curcuminoid content (% w/w)			
		curcumin	demethoxy curcumin	bisdemethoxy curcumin	total curcuminoid content
T1	Phitsanulok	3.38±0.05	2.24±0.23	1.53±0.41	7.16±0.58
T2	Nakhon Si Thammarat	5.60±0.04	2.76±0.02	2.56±0.06	10.93±0.07
T3	Ranong	5.97±0.15	4.42±0.07	3.79±0.06	14.24±0.29
T4	Chiang Rai	3.55±0.01	2.37±0.06	1.26±0.04	7.18±0.10
T5	Chiang Rai	3.99±0.03	2.38±0.03	2.45±0.03	8.84±0.01
T6	Chiang Mai	3.74±0.02	1.44±0.02	1.04±0.03	6.23±0.03
T7	Tak	3.40±0.11	2.18±0.03	1.80±0.08	7.38±0.11
T8	Tak	1.37±0.07	1.00±0.08	0.48±0.004	2.85±0.15
T9	Trang	4.40±0.06	1.90±0.02	1.69±0.05	7.99±0.11
T10	Trang	3.48±0.17	1.81±0.02	1.51±0.02	6.78±0.16
T12	Ratchaburi	3.24±0.13	1.80±0.05	1.39±0.06	6.44±0.17
T13	Ratchaburi	3.60±0.01	2.36±0.05	1.96±0.06	7.88±0.05
T16	Indonesia	3.93±0.02	1.97±0.04	1.76±0.07	7.66±0.13
T17	Chumphon	3.39±0.03	2.24±0.05	1.51±0.02	7.14±0.02
T19	Chiang Rai	1.04±0.07	1.37±0.08	0.56±0.04	2.97±0.09
T20	Phitsanulok	5.72±0.86	3.97±0.23	3.34±0.05	13.20±1.31
T21	Chaing Mai	4.02±0.14	2.36±0.05	1.80±0.01	8.19±0.18
T22	Tak	4.41±0.22	2.95±0.12	2.73±0.32	10.21±0.10
T23	Chaiyaphum	5.67±0.15	3.76±0.14	2.88±0.02	12.31±0.27
T25	Loei	2.80±0.19	1.26±0.05	1.18±0.08	5.24±0.33
T26	Loei	3.82±0.07	2.22±0.06	1.55±0.01	7.60±0.15
T27	Loei	2.81±0.16	1.31±0.05	1.14±0.05	5.25±0.25
T28	Udon Thani	1.04±0.05	0.45±0.03	0.08±0.00	1.58±0.07
T30	Sakon Nakhon	0.89±0.08	0.40±0.04	0.015±0.005	1.30±0.13

Table 18 (continued)

Turmeric Sample	Origin	Phichit experimental field			
		Curcuminoid content (% w/w)			
		Curcumin	demethoxy curcumin	bisdemethoxy curcumin	total curcuminoid content
T31	Nakhon Phanom	4.05±0.53	2.55±0.33	2.46±0.18	9.04±1.04
T32	Nakhon Phanom	1.02±0.04	0.45±0.04	0.02±0.001	1.50±0.09
T33	Chai Nat	3.71±0.05	2.82±0.05	2.37±0.07	8.90±0.18
T36	Malaysia	3.87±0.23	1.73±0.06	0.92±0.04	6.53±0.26
T37	Roi Et	4.79±0.20	2.95±0.17	2.70±0.34	10.44±0.31
T38	Nong Khai	0.58±0.03	0.24±0.01	0.00	0.82±0.04
T39	Mukda Han	0.57±0.09	0.19±0.03	0.00	0.77±0.07
T43	Bangladesh	5.14±0.16	2.74±0.06	2.07±0.06	9.96±0.27
T45	Nepal	3.69±0.08	2.24±0.11	1.84±0.13	7.76±0.17
T46	Nepal	4.68±0.17	4.02±0.16	3.13±0.12	11.82±0.45

Table 19 Curcuminoid contents of various turmeric rhizomes cultivated in Trang.

Turmeric Sample	Origin	Trang experimental field			
		Curcuminoid content (% w/w)			
		curcumin	demethoxy curcumin	bisdemethoxy curcumin	total curcuminoid content
T1	Phitsanulok	4.40±0.39	2.46±0.13	1.93±0.01	8.80±0.58
T2	Nakhon Si Thammarat	2.98±0.14	1.70±0.06	1.64±0.08	6.25±0.24
T3	Ranong	4.12±0.03	2.15±0.03	2.14±0.08	8.43±0.02
T4	Chiang Rai	2.69±0.04	1.46±0.03	1.48±0.05	5.65±0.12
T5	Chiang Rai	3.81±0.07	2.15±0.01	2.12±0.07	8.09±0.01
T8	Tak	0.93±0.06	0.69±0.04	0.32±0.01	1.98±0.15
T11	Trang	4.88±0.07	2.23±0.08	1.50±0.08	8.61±0.06
T12	Ratchaburi	5.65±0.24	2.82±0.09	2.26±0.09	10.74±0.43
T13	Ratchaburi	5.22±0.04	2.96±0.01	2.73±0.10	10.91±0.16
T16	Indonesia	5.83±0.05	3.46±0.03	2.39±0.04	11.68±0.09
T17	Chumphon	4.33±0.02	2.25±0.01	1.62±0.02	8.20±0.05
T19	Chiang Rai	2.58±0.04	1.74±0.03	0.94±0.03	5.27±0.10
T20	Phitsanulok	6.29±0.23	3.70±0.29	3.07±0.24	13.06±0.76
T22	Tak	7.52±0.78	4.66±0.51	4.29±0.15	16.46±1.45
T23	Chaiyaphum	6.26±0.19	3.66±0.02	2.64±0.07	12.56±0.25
T26	Loei	6.83±0.17	4.71±0.05	3.96±0.08	15.50±0.30
T28	Udon Thani	0.40±0.03	0.14±0.005	0.00	0.55±0.02
T30	Sakon Nakhon	0.64±0.05	0.18±0.03	0.04±0.01	0.86±0.09
T31	Nakhon Phanom	7.54±0.61	4.35±0.54	3.83±0.39	15.71±1.54
T32	Nakhon Phanom	0.38±0.08	0.10±0.001	0.00	0.48±0.09
T36	Malaysia	5.60±0.09	2.19±0.03	1.63±0.06	9.42±0.16
T37	Roi Et	6.03±0.01	3.48±0.02	3.74±0.08	13.27±0.11
T38	Nong Khai	0.94±0.10	0.37±0.03	0.03±0.002	1.33±0.13
T43	Bangladesh	5.30±0.27	2.58±0.05	2.14±0.07	10.04±0.33

Table 20 Curcuminoid contents of various turmeric rhizomes cultivated in Tak.

Turmeric Sample	Origin	Tak experimental field			
		Curcuminoid content (% w/w)			
		curcumin	demethoxy curcumin	bisdemethoxy curcumin	total curcuminoid content
T_1	Phitsanulok	5.92±0.17	3.87±0.22	3.82±0.29	13.61±0.69
T_2	Nakhon Si Thammarat	4.23±0.15	3.22±0.07	2.19±0.04	9.64±0.23
T_3	Ranong	4.58±0.07	2.98±0.03	3.85±0.02	11.41±0.11
T_4	Chiang Rai	2.69±0.16	1.66±0.12	1.83±0.17	6.18±0.45
T_5	Chiang Rai	4.85±0.04	2.76±0.05	2.91±0.03	10.62±0.14
T_6	Chiang Mai	6.43±0.09	4.20±0.10	1.95±0.01	12.58±0.20
T_7	Tak	4.21±0.09	2.30±0.04	2.60±0.06	9.12±0.19
T_8	Tak	2.04±0.005	1.29±0.005	1.14±0.005	4.48±0.005
T_9	Trang	4.33±0.02	4.16±0.24	2.60±0.15	11.09±0.41
T_{10}	Trang	5.65±0.11	3.76±0.04	2.69±0.09	12.10±0.06
T_{12}	Ratchaburi	4.37±0.07	2.79±0.02	3.17±0.05	10.32±0.14
T_{13}	Ratchaburi	6.85±0.01	3.72±0.07	3.88±0.15	14.46±0.21
T_{16}	Indonesia	5.01±0.27	3.99±0.27	2.82±0.25	11.79±0.76
T_{17}	Chumphon	3.81±0.11	2.28±0.07	2.40±0.03	8.52±0.24
T_{19}	Chiang Rai	1.55±0.13	0.93±0.01	0.89±0.05	3.38±0.19
T_{20}	Phitsanulok	5.81±0.49	3.68±0.10	4.13±0.44	13.61±0.55
T_{22}	Tak	6.37±0.75	3.94±0.35	4.23±0.26	14.52±0.85
T_{23}	Chaiyaphum	6.55±0.21	4.02±0.09	4.49±0.34	15.06±0.22
T_{25}	Loei	4.95±0.01	3.90±0.00	2.91±0.03	11.76±0.01
T_{26}	Loei	5.09±0.11	2.73±0.32	2.91±0.26	10.73±0.61
T_{28}	Udon Thani	0.95±0.01	0.35±0.005	0.19±0.03	1.49±0.02
T_{30}	Sakon Nakhon	0.86±0.13	0.33±0.05	0.14±0.001	1.36±0.13
T_{31}	Nakhon Phanom	5.64±0.09	2.84±0.20	3.57±0.38	12.38±0.64
T_{32}	Nakhon Phanom	0.92±0.12	0.27±0.005	0.11±0.00	1.30±0.12

Table 20 (continued)

Turmeric Sample	Origin	Tak experimental field			
		Curcuminoid content (% w/w)			
		curcumin	demethoxy curcumin	bisdemethoxy curcumin	total curcuminoid content
T33	Chai Nat	4.38±0.08	2.41±0.04	2.80±0.16	9.59±0.28
T34	Suphan Buri	5.52±0.15	3.50±0.08	3.86±0.05	12.91±0.29
T36	Malaysia	4.73±0.01	3.12±0.02	2.51±0.11	10.37±0.11
T37	Roi Et	6.03±0.01	3.48±0.02	3.74±0.08	13.27±0.11
T38	Nong Khai	1.00±0.02	0.38±0.005	0.16±0.01	1.55±0.00
T39	Mukda Han	1.10±0.04	0.38±0.015	0.18±0.005	1.67±0.09
T43	Bangladesh	5.78±0.05	3.87±0.06	2.88±0.10	12.53±0.21
T46	Nepal	3.95±0.06	2.11±0.05	1.90±0.03	7.95±0.14
T47	Satun	5.54±0.21	3.59±0.12	3.10±0.10	11.22±0.39
T48	Trang	4.22±0.09	3.48±0.03	2.84±0.08	10.54±0.09
T49	Trang	5.18±0.23	3.24±0.05	3.81±0.05	12.26±0.36

Table 21 Volatile oil content (%v/w) from various turmeric cultivar regrown in Phichit, Trang and Tak experimental fields.

Turmeric cultivar	Origin	Volatile oil content (%v/w) ($\bar{x}$±SD)		
		Experimental field		
		Phichit	Trang	Tak
T1	Phitsanulok	10.1±0.03	10.46±0.13	16.47±0.26
T2	Nakhon Si Thammarat	6.23±0.10	7.76±0.06	5.51±0.03
T3	Ranong	7.97±0.02	8.10±0.05	11.75±0.01
T4	Chiang Rai	6.58±0.07	6.83±0.05	12.27±0.16
T5	Chiang Rai	8.20±0.03	7.76±0.16	13.35±0.10
T6	Chiang Mai	5.64±0.01	-	6.84±0.02
T7	Tak	6.80±0.00	-	12.87±0.25
T8	Tak	7.15±0.02	6.66±0.08	9.40±0.06
T9	Trang	6.32±0.11	-	5.78±0.04
T10	Trang	4.88±0.01	-	5.98±0.05
T11	Trang	-	6.20±0.12	-
T12	Ratchaburi	6.99±0.10	6.19±0.02	12.45±0.12
T13	Ratchaburi	6.85±0.07	7.16±0.13	12.62±0.08
T16	Indonesia	4.74±0.07	5.42±0.17	5.67±0.06
T17	Chumphon	10.11±0.10	10.72±0.14	14.08±0.12
T19	Chiang Rai	6.63±0.02	6.65±0.03	10.25±0.03
T20	Phitsanulok	7.52±0.29	8.55±0.04	11.89±0.17
T21	Chiang Mai	7.59±0.09	-	-
T22	Tak	8.71±0.10	8.29±0.04	11.40±0.20
T23	Chaiyaphum	7.83±0.12	7.06±0.27	11.79±0.05
T25	Loei	5.54±0.05	-	7.56±0.06
T26	Loei	7.20±0.14	8.93±0.12	10.85±0.05
T27	Loei	4.85±0.07	-	-
T28	Udon Thani	4.51±0.05	4.71±0.11	8.11±0.04
T30	Sakon Nakhon	5.11±0.14	4.72±0.06	7.18±0.12

Table 21 (continued)

Turmeric cultivar	Origin	Volatile oil content (%v/w) ($\bar{x}$±SD)		
		Experimental field		
		Phichit	Trang	Tak
T31	Nakhon Phanom	8.88±0.08	7.60±0.04	12.82±0.10
T32	Nakhon Phanom	4.83±0.02	4.15±0.06	7.88±0.10
T33	Chai Nat	7.89±0.10	-	11.83±0.21
T34	Suphan Buri	-	-	12.06±0.08
T36	Malaysia	4.50±0.07	5.69±0.02	6.70±0.04
T37	Roi Et	7.93±0.06	7.97±0.03	11.67±0.04
T38	Nong Khai	4.53±0.08	5.08±0.08	9.01±0.05
T39	Mukda Han	4.24±0.06	-	5.66±0.12
T43	Bangladesh	6.43±0.04	4.60±0.04	5.34±0.05
T45	Nepal	5.02±0.04	-	-
T46	Nepal	8.94±0.10	-	12.28±0.14
T47	Satun	-	-	5.50±0.12
T48	Trang	-	-	6.00±0.10
T49	Trang	-	-	12.30±0.14

Table 22 Curcuminoid content (%w/w) of selected zingiberaceous plants by TLC-densitometry.

Plant	Curcuminoid content (%w/w) ($X \pm SD$)			
	curcumin	demethoxy curcumin	bisdemethoxy curcumin	total
Curcuma longa	4.790±0.080	2.630±0.210	1.950±0.030	9.380±0.140
C. zedoaria	0.207±0.046	3.085±0.187	0.519±0.038	3.811±0.263
C. sp (Phaya Waan)	0.405±0.044	0.519±0.028	0.354±0.017	1.279±0.072
C. aromatica	0.139±0.019	0.684±0.063	0.105±0.013	0.928±0.094
C. caesia	0.453±0.005	0.299±0.003	0.116±0.001	0.868±0.010
C. sp (Waan Ma Lueang)	0.243±0.018	0.250±0.020	0.062±0.005	0.555±0.043
Zingiber cassumunar	0.220±0.012	0.024±0.005	0.023±0.003	0.267±0.017
Globba malaccensis	0.106±0.019	0.079±0.017	-	0.186±0.030
Z. zerumbet	0.041±0.005	0.069±0.003	0.009±0.002	0.120±0.006
C. sp (Waan En Lueang)	0.031±0.007	0.014±0.003	0.014±0.001	0.059±0.009
C. mangga	-	0.009±0.001	-	0.009±0.001
Z. officinale	-	-	-	-
C. comosa	-	-	-	-
C. aeruginosa	-	-	-	-

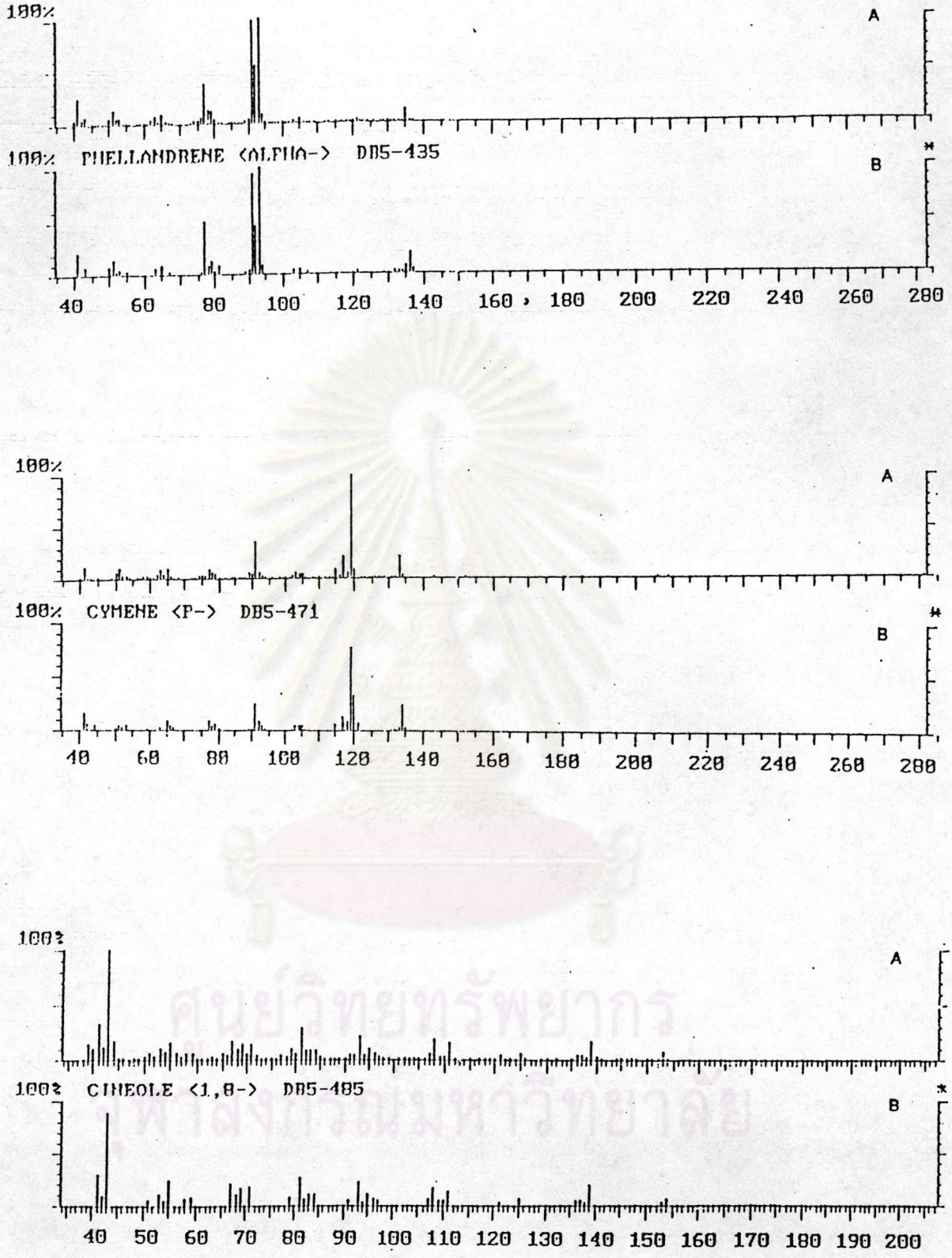
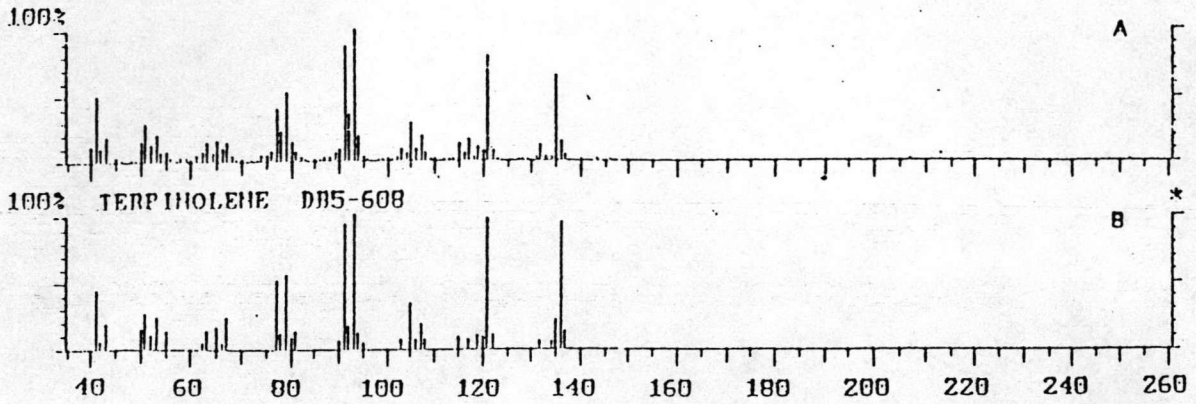
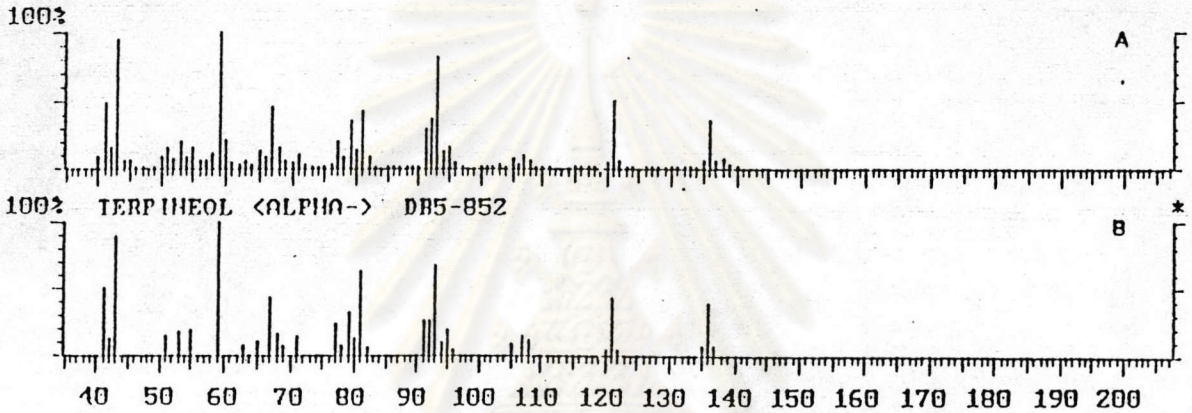


Fig.33 Mass spectra of volatile oil components in turmeric compared with authentic material. A) volatile oil component and B) authentic material.





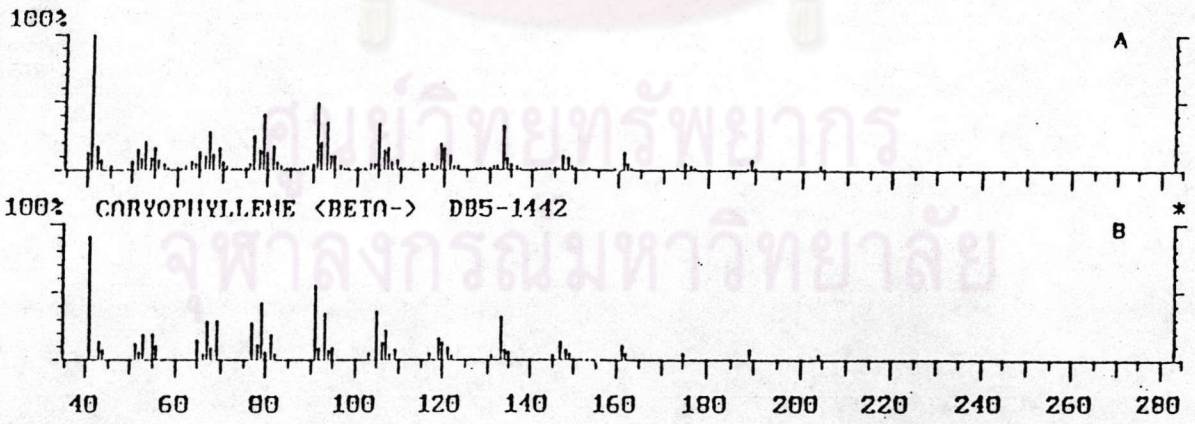
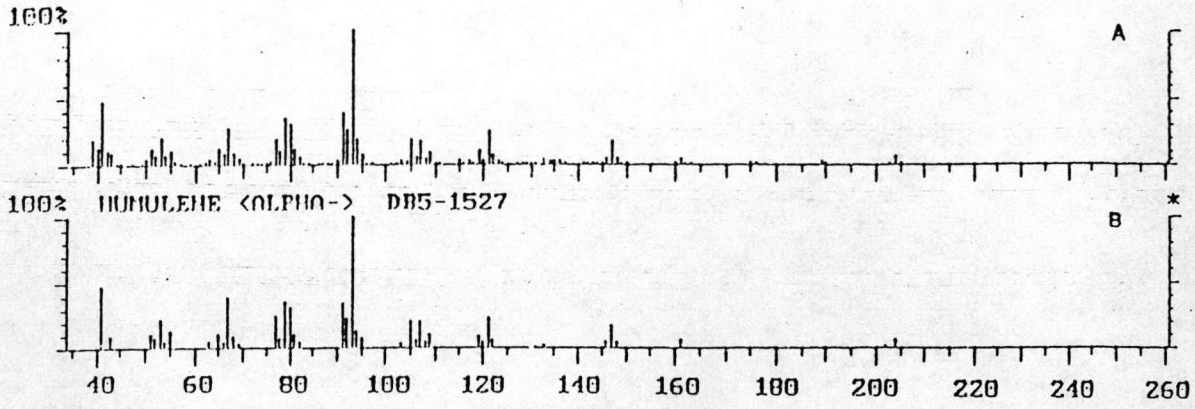
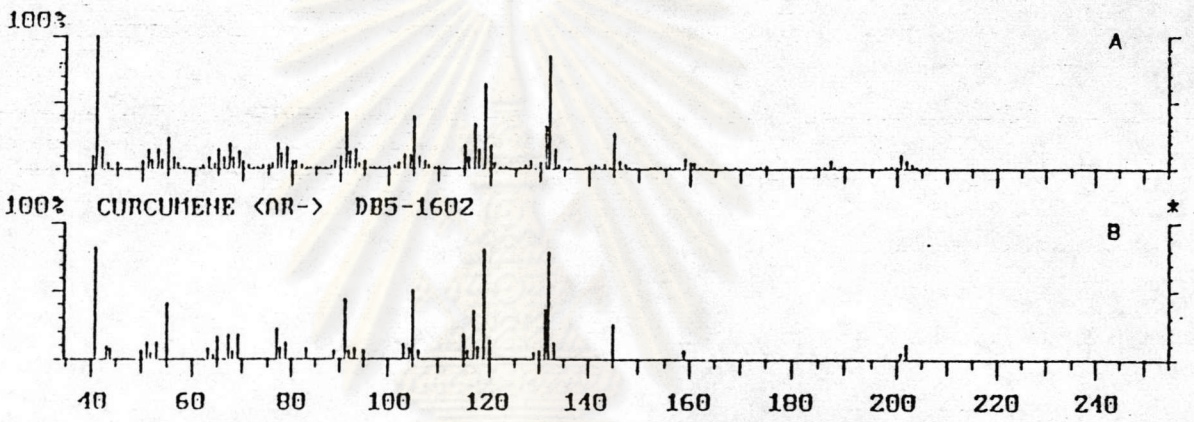


Fig.33 (continued)





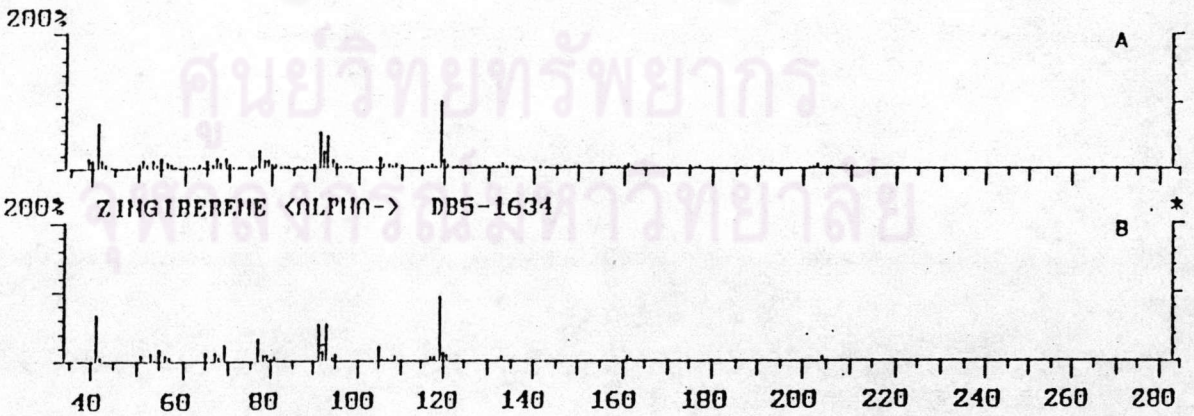
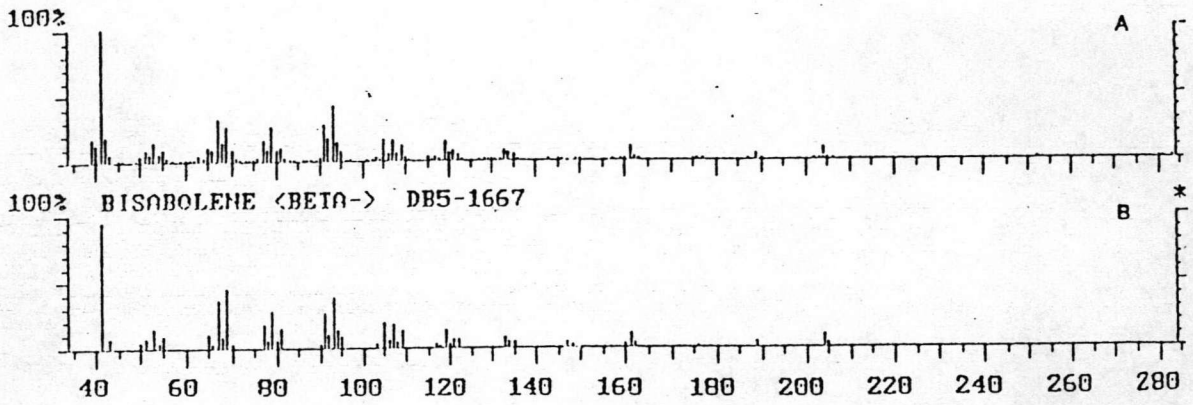
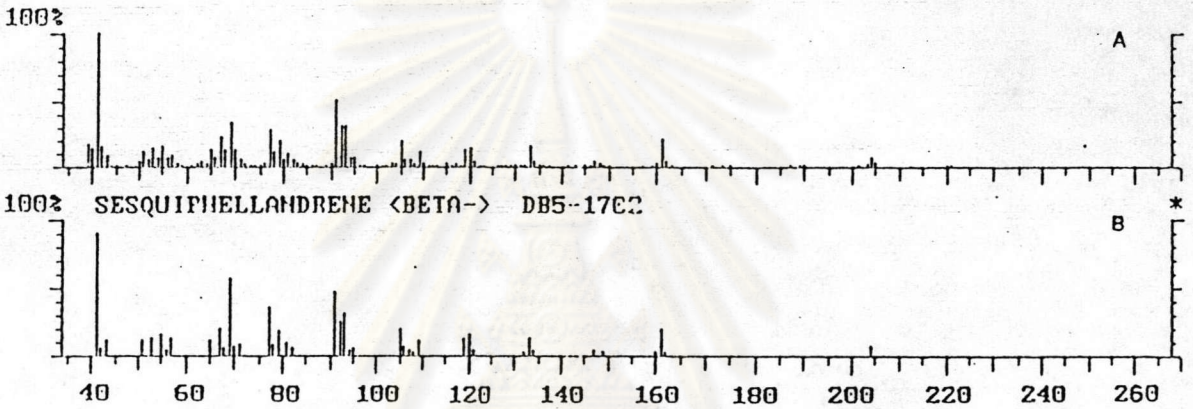


Fig.33 (continued)





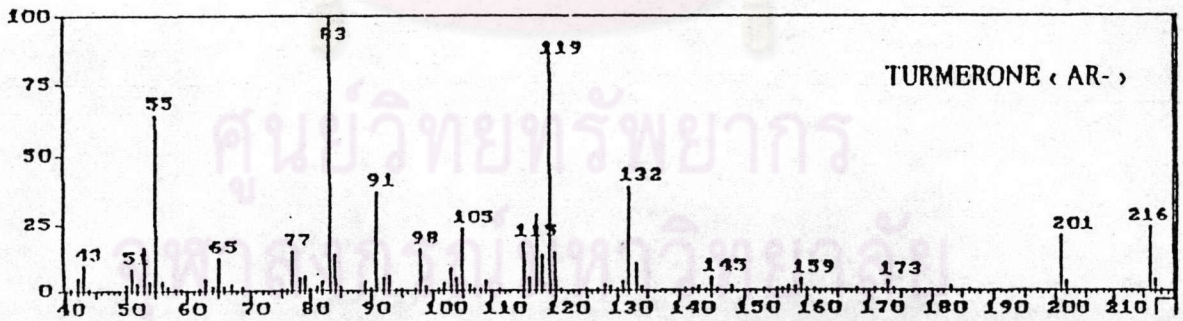
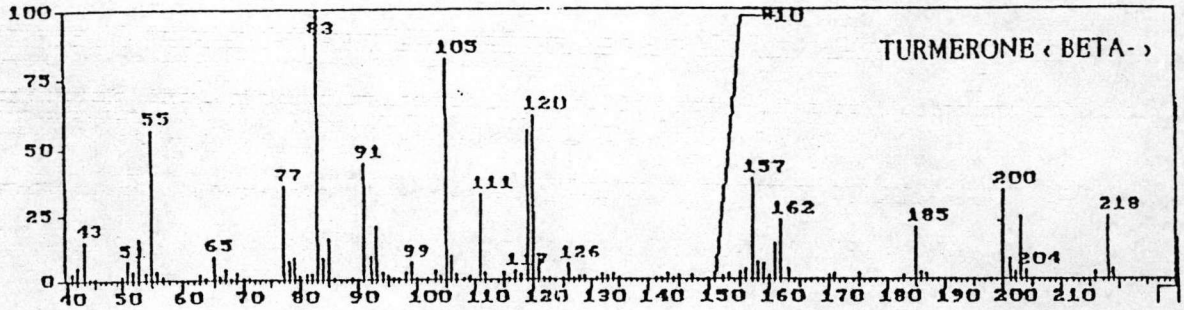


Fig.33 (continued)



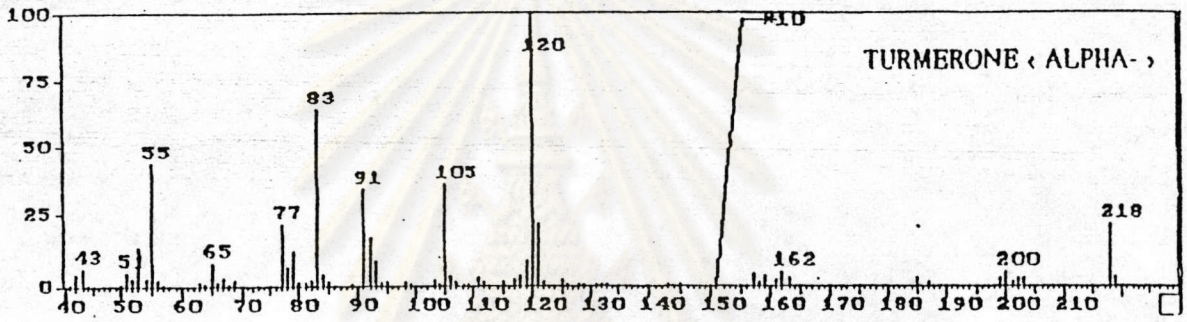


Fig.33 (continued)

VITA

Miss. Supinya Tewtrakul was born on May 24,1968 in Songkhla, Thailand. She recieved her Bachelor of Science in Pharmacy in 1991 from Prince of Songkhla University, Songkhla, Thailand. At present she is a faculty member of the Department of Pharmacognosy and Pharmaceutical Botany, Faculty of Pharmacy, Prince of Songkhla University, Songkhla, Thailand.