

1950년 국산

최 종
연구보고서

밀랍의 제법과 활용에 관한 연구

Processing Methods of Beeswax and its
Application to Products

연구기관

농협대학농산물가공기술연구소

농림부행정자료실



0005764

농 립 부

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1997. 11. 29.

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가

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I.

II.

(蜜蠟, Bee's wax)

가

10 g

1 g

10% 가

가 가

가

가

100%

1,500 MT

가

가가

가

III.

50 , ,
 , ,
 KOTRA 가
 , .

IV.

:
 50,000
 35% ,
 巢礎 ()
 가
 , (yellow beeswax),
 (white beeswax) . 1994 174
 , 1995 142 , 2 가
 .
 1994 韓蜂 336,000
 1,500M/T 39.81 ± 3.77M/T
 . 1994
 400M/T 26.7% , 10.62M/T

. 1996 342M/T
 9. 1M/T
 . 1994 140M/T
 , 39. 81 ± 3. 77M/T 가
 28. 4% 가 .
 , :
 가 4- 15
 17- 24 5- 9
 .
 1- 8, 55- 77, 10- 15, 40- 60,
 64- 66 . methylation 가 (GC)
 (MSD) Covat' s index 14
 28 15 18 2 .
 23 31 .
 가
 .
 : 韓蜂 가
 i)
 가 . ii)
 . iii) 가
 .

Crude Beeswax ,

30-40 , 90-100 , 5%,

Carbon: Clay = 50: 50, 가

0.3 , 1.5 - 2 , steam 5% 200 , 가

: , 가

가 가 가 .

가 .

가

가

SUMMARY

Beeswax is known to be used initially for the preservation of Mummy in Egypt of approximately AD 4200 and for a candle at about AD 100 and a value of money at BC 5-15 centuries.

A wax is a material with properties between those of a fat and a resin. The oldest wax known to man is beeswax, and other materials with the physical characteristics of beeswax also became known as waxes.

Beeswax can be divided into *Apis mellifera* and *Apis cerana*. Genus of bee, *Apis*, is the only insect of many insects which produces wax used in industry. It is because only beeswax can be refined to white color. Because of its unique viscosity, emulsifying property, consistency regulating property and thermoplastic nature, beeswax is used in cosmetics, pharmaceuticals, candles, foods and polishes. The wax is secreted by wax glands of the abdomen of the worker bee. One and half to three pounds of wax is obtained from ten combs. The side walls of the combs are remarkably thin, so the foundation and the capping have relatively large amount of wax. Beeswax is mainly composed of esters, free fatty acids, hydrocarbons and alcohols. The chemical compositions and the analytical values of European and Oriental beeswaxes are different. Most of beeswax used in Korea is imported from Europe, China and USA. But no effort has been made to industrialize Korean beeswax produced by *Apis cerana* even though the potential productivity is over 1,600 tone a year.

As the first step for industrializing the Korean beeswax produced by *Apis cerana*, we collected bee-hives from various areas (Ayung, Chilgok, Dongil,

Ogok, Sanchung & Yongok), and analyzed the physical and chemical values and the composition of hydrocarbons, free fatty acids and fatty acids of esters. Beeswaxes of different origins had different analytical values and different chemical compositions. The acid values, peroxide values, saponification numbers, iodine numbers, ester values and melting points were 3.3-13.0, 0.9-8.1, 45.8-76.5, 8.8-16.9, 42.5-64.3 and 64.6-66.5°C, respectively. Raw and refined beeswaxes showed different analytical values. C16 fatty acid prevailed among fatty acids between C14-C28. Odd-numbered hydrocarbons prevailed over even-numbered ones.

The beeswax was collected, isolated and refined from beehives. The first step of procedures of beeswax was to separate honey from beehives. The cut beehives was put in hot water and placed. The upper layer was crude beeswax and the crude beeswax was treated with phosphoric acid and bleached. Honey-makers did not collect and purify beeswax because they did not know the economical values of beeswax based on the chemical composition and physical properties, and the procedures of refining beeswax.

Crude beeswax was purified by optimizing the conditions of bleaching and deodorizing processes and the laboratory and optimized apparatus was developed by several experiments based on the basic principles of bleaching and deodorizing processes. The purified Korean beeswax was applied as an ingredient for medical ointment, cosmetics and capsule. The products made from the Korean beeswax were better than those done by American beeswax. The experimental products showed the similar properties to the products used in industry. Therefore, the experimental products made from Korean beeswax were evaluated to be used instead of imported beeswax and the Korean beeswax could be used successfully as an ingredient for several commercial

products.

This research surveyed the amount of Korean beeswax, showed the collecting and refining method of beeswax, and studied the chemical composition and physical properties of beeswax. Therefore, the results of this research will help to industrialize Korean beeswax by the refining method of beeswax. Honey-makers may increase their income from beeswax as well, if they use beeswax as a source of income.

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1	-----	36
1.	-----	36
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2	-----	38
1.	-----	38
2.	-----	40
4	-----	45
1	-----	45
2	-----	48

5	-----	50
1	-----	50
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1.	-----	85
2.	-----	86
3.	-----	88
4.	-----	89

1

1

1.

(蜜蠟, Bee's wax)

가

10 g

1 g

10% 가

가 가

가

1.

	1990	1991	1992	1993	1994
(Kg)	98,131	120,078	114,650	129,708	151,105
(\$)	606	800	699	858	1,051

: (1995)

2.

가.

(樂)

가 ,

.

. .

가

가

UR

가

가

가

가 가

. 가

가

가

가 가 가

10

가

가

100%

1,500 MT

가

가 가

가

.

3.

<p>1 (1996)</p>	<p>1. 2. 3.</p>	<p>1. 2. 3. , 1. 2. 가 3. 1. 2. 3. 4.</p>
<p>2 (1997)</p>	<p>4. 5. 6.</p>	<p>1. 2. pore size 3. 1. 2. Steam blowing 3. 1. 2.</p>

2

醋

가

, 微結晶性

가

Koster Keunen社가

PG-3 beeswax

乳濁液

. Koster Keunen

同社

, 抗

quercitrin

(10-100ppm)

가

LD50가

가

가

whey protein-beeswax film, casein-beeswax film

産學

가 , . 高酸價 , 低酸價
가 ,
*Apis mellifera*가 가
. 가
가 . Cerarica Noda社 가
가
가 , ,
가 .

2

1

50

(4200)

100

pitch

5-15

가

1853 - carnauba wax

1868 - paraffin wax가

1897 - montan wax

1927 - I. G. wax, BASF wax

1950 - fischer-tropsch wax

1951 - polyethylene wax

wax fat resin 가 beeswax

beeswax carnauba wax long chain alcohol ester, acids

2

wax

Table 2. Physical properties of major commercial natural waxes

Physical properties	Bees wax	Wool wax	Candelilla	Carnauba	Rice bran
Melting point	61- 65	38- 44	66- 71	82.5- 86	79- 82
Flash point	> 240	-	> 240	290	-
Specific gravity at 25	0.950- 0.960	0.930- 0.945	0.982- 0.983	0.996- 0.998	-
Acid value	17- 24	5- 20	11- 19	2- 6	5- 13
Saponification value	87- 104	80- 120	44- 66	78- 88	70- 95
Ester value	70- 80	70- 80	40- 47	45- 85	60- 90
Unsaponifiables	45- 55%	39- 51%	47- 62%	50- 55%	50- 60%
Iodine value	7- 12	18- 36	19- 44	7- 14	5- 15
Hydroxyl value	15	23- 53	-	50- 54	-

, 가

가

가

(flavonoids)

가

2

KOTRA

1.

1988

685,500 M/T

1/2

1987

1995

가

1987 10

1995 39

3.9 가 .

3.

가		(kg)	(M/T)	(M/T)	(M/T)	(M/T)	(M/T)
1988	8,660,000	26.7	200,000	70,000	0	130,000	200,000
1987	8,320,000	26.7	204,000	66,831	0	137,169	204,000
1986	6,000,000	24.0	160,000	80,589	0	79,411	160,000
1985	6,000,000	30.0	150,000	54,800	0	95,200	150,000
1984	6,000,000	25.0	140,000	50,000	0	90,000	140,000
1983	5,700,000	19.6	100,000	58,100			
1988	8,100,000	23.7	192,000	20,000	0	172,000	192,000
1987	8,000,000	23.8	190,000	20,871	0	169,129	190,000
1986	8,300,000	25.3	210,000	20,607	0	189,393	210,000
1985	8,157,000	25.0	204,000	22,698	0	181,302	204,000
1984	7,882,000	24.5	193,000	24,226	0	176,774	201,000
1983	8,000,000	23.0	190,000	16,000			
1988	3,190,000	26.6	85,000	5,000	27,200	140,000	197,000
1987	3,190,000	32.3	103,000	(5,610)2	26,400	150,000	240,000
1986	3,200,000	28.4	90,898	5,600	59,149	132,404	251,193
1985	3,200,000	21.3	68,000	(6,325)2	63,957	116,165	220,351
1984	3,200,000	23.4	75,000	3,357	56,246	114,215	206,056
1983	4,275,000	22.8	93,000	3,039	37,900		
				3,447			
1988	2,500,000	17.6	44,000	36,500	0	7,650	44,679
1987	2,500,000	19.1	47,850	36,559	0	(7,700)	48,038
1986	2,500,000	21.6	54,000	57,992	0	7,800	65,580
1985	2,500,000	22.4	56,000	42,380	0	7,400	61,960
1984	2,300,000	26.1	60,000	54,040	0	8,000	68,000
1983	2,300,000	25.5	64,000	40, 000		8,000	
1988	1,500,000	26.7	40,000	33 ,000	0	5,000	40,662
1987	1,500,000	26.7	40,000	36 ,253	0	5,000	41,915
1986	1,500,000	24.0	36,000	30,918	0	5,000	37,833
1985	1,500,000	30.0	45,000	42,173	0	5,000	49,006
1984	1,400,000	25.0	35,000	26,601	0	5,500	36,107
1983	1,300,000	25.5	28,000	29,900			
1988	1,980,000	18.2	36,000	600	800	36,200	36,800
1987	1,900,000	16.1	30,500	406	1,248	31,342	31,748
1986	1,900,000	16.3	31,000	1,960	576	29,616	31,576
1985	1,350,000	15.1	28,000	853	460	27,607	28,460
1984	1,600,000	15.6	25,000	35	460	25,441	25,476
1983	1,800,000	13.3	22,000	600			

가		(kg)	(M/T)	(M/T)	(M/T)	(M/T)	(M/T)
1988	620,000	58.1	36,000	15,000	420	25,420	48,420
1987	701,000	58.0	40,647	10,903	391	24,135	47,038
1986	707,000	48.1	34,041	11,843	265	21,463	39,306
1985	694,000	52.0	36,120	17,278	246	20,601	42,879
1984	692,000	62.6	43,298	18,871	196	25,441	50,747
1983	657,000	51.3	34,800	9,500			
1988	560,000	51.8	29,000	13,105	200	15,500	30,317
1987	552,000	50.8	28,000	11,785	223	15,621	28,523
1986	542,000	46.3	25,007	11,874	99	14,207	26,381
1985	560,000	48.0	26,871	14,653	87	13,359	29,217
1984	529,000	52.9	27,997	17,426	129	13,328	33,013
1983	405,000	56.0	21,500	1,100			
1988	1,070,000	16.8	18,000	15,000	83,000	87,000	104,000
1987	1,070,000	15.0	16,000	15,000	83,000	86,000	104,000
1986	1,150,000	13.9	16,000	16,000	87,000	83,000	104,000
1985	1,109,000	9.9	11,000	14,000	79,000	77,000	92,000
1984	1,147,000	13.9	16,000	10,000	74,000	80,000	92,000
1983	1,118,000	12.6	15,000		62,900		
1988	269,000	20.4	5,500	0	38,000	46,500	50,500
1987	272,000	22.1	6,023	0	40,129	43,152	50,512
1986	282,000	19.7	5,553	0	36,354	40,907	44,907
1985	271,000	26.7	7,225	0	28,946	38,771	41,771
1984	291,000	23.4	6,798	0	33,178	38,476	44,976
1983	299,000	21.4	6,500		28,100		
1988			685,500			665,270	
1987			706,000				
1986							
1985							
1984							
1983			896,300	214,300	224,700		

1. (825, (053) 66- 6474), “ ”,
 , 25 , 5 , p27-28, 1991
2. (), “ ”, , 24
 , 5 , p4-10, 1990
3. , “ ”, , 20 , 3 , p24-28, 1986
4. (E. Crane), “ ”, , 19 5 , p4-7, 1985

4.

	() 1	3	3	2	
					M/T
1987	534,391	433,434	100,957	66,761,872	
1988	584,443	449,530	134,913	81,438,000	8,3725
1989	686,094	436,247	199,847	71,499,514	
1990	526,603	331,108	195,495	55,997,800	7,9804
1991	532,826	299,952	232,874	80,309,350	
1992	596,512	299,243	297,269	38,120,420	
1993	604,311	305,634	334,677		
1994	662,678	326,471	336,207		
1995	777,292	377,350	399,942		

1. 1995
2. , 1993
3. , 1995 6
4. , `98. 8,
5. , , 1990

2. .

가.

養蜂

, .
 , , ,
 , .
 가 가 .
 50,000 (5)
 35% , 巢礎(
) .

5.

가	(M/T)			
	50,000		1990	1
	1,360		1990	1
	3,175			
	3,300		1990	2
	2,040		1990	3
	731		1983	2
	800		1994	3

1990 3,175 1,360
 가
 (EEC)

3,300 2,040 , ,
 1994 17 가 800 , ,
 , 530 66% .
 가 , ,

가

가

養蜂

가

가

(6)

(yellow

beeswax),

(white beeswax)

1994

174 , 1995

142

2

가

가

()

가

100%

養蜂

Apis mellifera

洋蜂

Apis cerana

韓蜂

洋蜂

採蜜

採蜜器

貯蜜

採蠟

가

.

가

. 韓蜂

洋蜂

.

가 養蜂

가

韓蜂

.

6.

가		1991	1992	1993	1994	1995
	M/T	3,360	5.080	6.600	3.600	
	₩	13,600,516	18,279,210	15,549,702	228,570,833	
	M/T	15,000	16.000	38.210	52.000	42.000
	₩	27,564,946	31,805,982	73,574,891	108,910,203	119,340,041
	M/T	35,090	22.325	23.675	35.575	31.375
	₩	128,774,592	89,952,174	95,419,612	142,401,639	139,804,749
	M/T	0.825	0.326			0.500
	₩	27,580,353	13,117,699			2,259,061
	M/T	44,919	49.992	60.715	64.292	58.678
	₩	312,673,206	321,459,898	503,151,792	561,974,738	668,004,623
	M/T	20.807	15.886	0.393	18.997	9.486
	₩	76,067,364	61,410,169	1,758,583	79,633,883	49,321,539
	M/T		5.000			
	₩		10,063,343			
	M/T	120.001	114.609	129.593	174.464	142.039
	₩	586,260,977	546,093,168	689,454,580	906,511,308	978,730,013
	M/T			0.210		0.300
	₩			2,205,067		3,539,557
	M/T				1.100	0.038
	₩				4,253,907	2,955,824
M/T					10.000	
₩					37,547,791	
M/T			0.210	1.100	10.338	
₩			2,205,067	4,253,907	44,043,172	

韓蜂 1

養蜂 . (韓蜂)

3

加水 가

1

1kg

26.54 ± 2.51g (7).

(8).

가 . 1

가

7. 1

	(g)	(g)	(g)	(g)	(g)	(g)/ (kg)
A	4,011	1,171	2,350	430.0	60.0	25.53
B	3,703	1,132	2,086	423.7	61.3	29.39
C	3,877	1,403	2,021	403.1	49.9	24.69
	3,863 ± 154.4	1,235.3 ± 146.5	2,152.3 ± 174.2	418.9 ± 14.1	57.1 ± 6.2	26.54 ± 2.51

8. ()

蜂種	(M/T)	(M/T)
	7,500	-
	1,500	39.81 ± 3.77
	400	10.62 ± 1.00

가

1994 韓蜂 336,000 1,500M/T
 39.81 ± 3.77M/T
 . (8) 1994 400M/T
 26.7% , 10.62M/T

9.

()

		(M/T)	(kg)()	
韓 蜂	10	342	265.4	9,076.68
	38		1,008.52	
	49		1,300.46	
	9		238.86	
	8		212.32	
	5		132.7	
	40		1,061.6	
	53		1,406.62	
	27		716.58	
	42		1,114.68	
	2		53.08	
	3		79.62	
	6		159.24	
	13		345.02	
	24		636.96	
	2		53.08	
	7		185.78	
4	106.16			
洋 蜂		1,363	-	

-1996 6 30
-韓蜂 洋蜂

(韓蜂.洋蜂

5

76M/T

)

가

- ' , , 1996

1996

342M/T

9. 1M/T

(5). 1994

2

140M/T

39. 81 ± 3. 77M/T

가

28. 4%

가 .

,

,

,

,

.

3

1

1.

가

7

10.

		478- 2
		408- 1
		442- 2
		593 가
	,	305
		94- 5
		696- 6

2.

가. : , , , , , ,

AOCS Official Method

.

, 가

가

(GC/MSD)

가

.

3

.

lipolysis methylation

가

mass selective detector

computer library

data program

matching

가

retention time

.

가

n-parafins

retention time index

.

가 (:) 가
 가 가
 가

Table 12. Analytical values of Korean beeswax produced by *Apis cerana*

Origin	Acid value	Peroxide value	Saponification number	Iodine number	Ester value	Melting point
Ayung	5.44	2.25	64.09	10.01	58.65	65.2
Chilgok	4.85	0.96	58.17	9.16	53.32	66.5
Dongil	4.78	8.13	63.16	10.60	58.38	66.0
Hamyang	12.14	1.75	76.53	15.23	64.39	66.2
Ogok	3.35	1.04	45.87	8.85	42.52	64.6
Sanchung	5.71	1.32	54.97	9.32	49.25	66.1
Yongok	13.08	2.97	61.13	61.13	48.05	64.7

2.

mass selective detector

Wiley

NBS75K.L mass data matching Covat's index

Sigma

chemical co.

Table 13. Analytical values of Korean beeswax collected at each refining step (The origin is Ayung.)

Refining Step	Acid value	Peroxide value	Saponification number	Iodine number	Ester value	Melting point
a	3.67	0.23	130.00	8.53	126.33	66.7
b	4.59	0.42	80.33	9.55	75.23	66.1
c	5.10	1.62	72.19	10.43	67.60	66.3
d	5.51	2.90	64.36	11.15	58.85	65.2

a : raw beeswax

b : beeswax melted and washed before the treatment of phosphoric acid

c : beeswax treated with phosphoric acid and washed before bleaching

d : bleached beeswax

Table 14. Peak areas and concentrations of fatty acids of different origins identified as methyl esters.

RT	Name	Peak area(a)(x 106) and concentration(b)(ng/1 μ l solvent)													
		Ayung		Chilgok		Dongil		Hamyang		Ogok		Sanchung		Yongok	
		a	b	a	b	a	b	a	b	a	b	a	b	a	b
12.13	C14:0 ME	15.1	46.7	5.9	14.6	8.0	21.9	35.7	118.5	5.5	13.2	12.8	38.6	19.6	62.4
17.85	C16:0 ME	607.1	1900.0	232.4	724.9	338.8	1058.8	328.6	1026.8	185.7	580.8	607.7	1900.6	1005.4	3149.9
23.46	C18:0 ME	14.9	47.6	6.5	21.5	9.6	31.1	43.8	137.3	8.3	27.1	17.0	54.1	22.8	72.1
29.16	C20:0 ME	-	-	1.9	8.2	2.4	10.0	15.5	58.4	1.5	6.7	5.1	20.0	4.2	16.7
34.66	C22:0 ME	22.2	72.1	12.4	40.9	12.9	42.5	22.3	72.5	7.9	26.6	26.1	84.6	9.9	33.0
39.88	C24:0 ME	26.8	231.9	15.6	135.5	16.0	138.9	21.2	183.7	9.5	82.9	27.7	239.6	15.3	132.9
44.51	C26:0 ME	24.9	236.8	7.1	64.7	5.7	54.2	6.7	61.7	4.1	42.2	11.3	96.1	13.5	114.8
50.19	C28:0 ME	41.1	1027.5	10.8	270.0	9.9	147.5	13.6	340.0	5.0	-	15.1	-	8.0	200.0
22.56	C18:1 ME	61.3	-	18.1	-	-	-	69.0	-	-	-	161.7	-	27.3	-
22.35	C18:2 ME	11.5	-	2.7	-	9.7	-	7.8	-	-	-	35.8	-	-	-

RT : retention time

Table 15. Peak areas of hydrocarbons of different origins.

RT	Name	Peak area(x 106)						
		Ayung	Chilgok	Dongil	Hamyang	Ogok	Sanchung	Yongok
23.28	C23	-	-	-	51.8	-	-	28.7
30.97	C24	48.4	4.3	6.7	3.8	3.9	5.7	1.1
33.93	C25	-	218.1	214.9	279.5	156.5	417.5	186.5
36.30	C26	-	23.7	27.7	27.1	17.5	272.1	18.2
39.00	C27	15.6	664.9	-	846.8	523.8	31.6	598.3
41.22	C28	-	7.1	10.6	6.1	5.4	-	5.2
43.62	C29	-	22.5	32.2	29.7	22.5	10.0	25.9
47.47	C30	-	1.1	-	-	-	39.4	-
48.39	C31	-	-	1.7	-	-	-	-

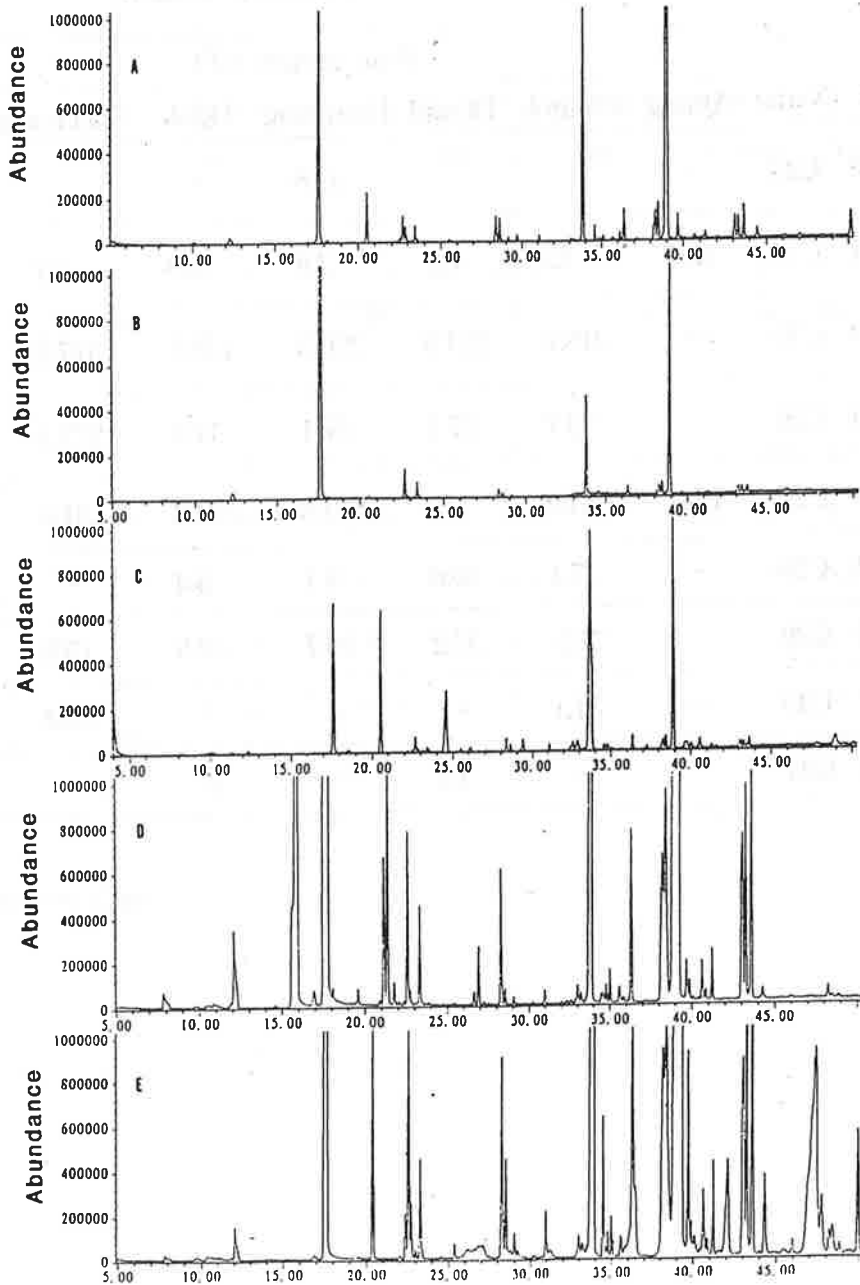


Figure 1. Total ion chromatograms of volatile compounds of methylated beeswax by different methylation methods.

A - C : Chemical Co. Method D : Rapid Method E : AOAC Method

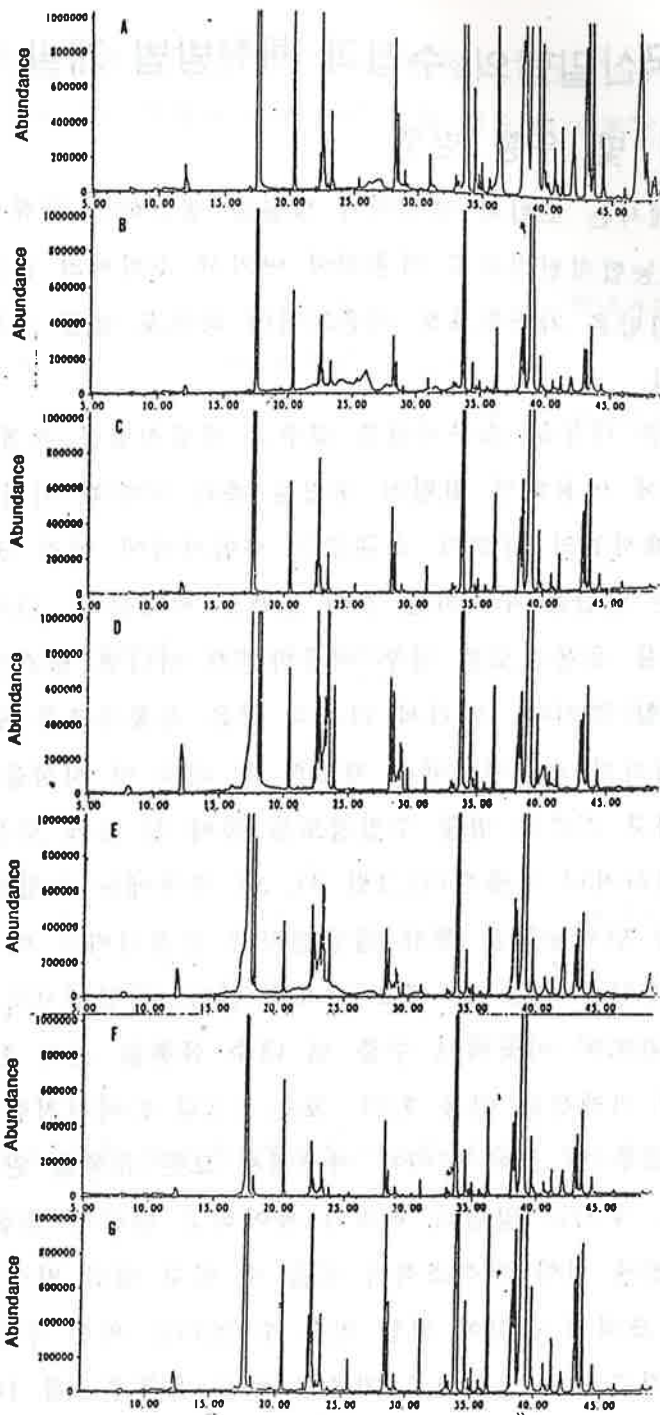


Figure 2. Total ion chromatograms of volatile compounds of methylated beeswax by different areas.

A : 아영 B : 오곡 C : 중일 D : 함양 E : 연곡 F : 철곡 G : 산청

4

1

가

가

韓蜂

韓蜂

가

가

, 韓蜂 가

가

(3).

가

(4)

가

가

, 가

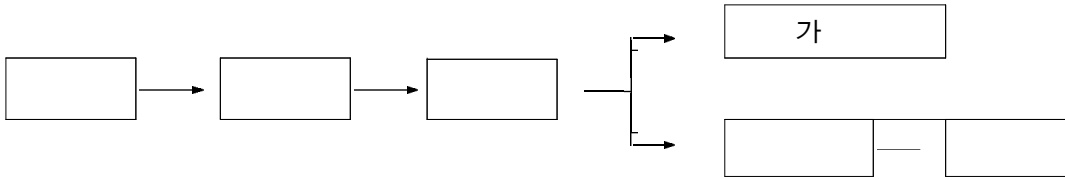
가

100%

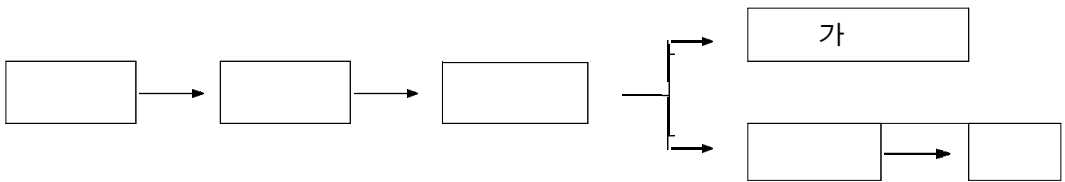
가

가

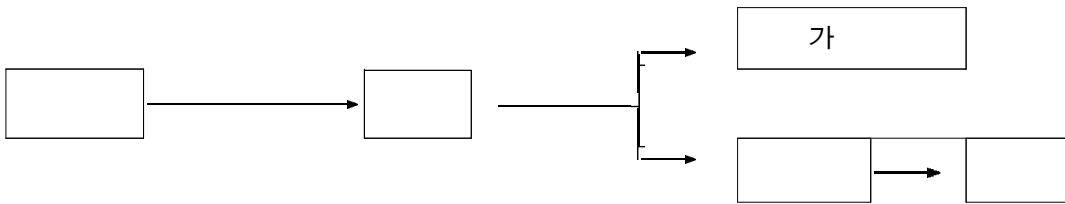
()



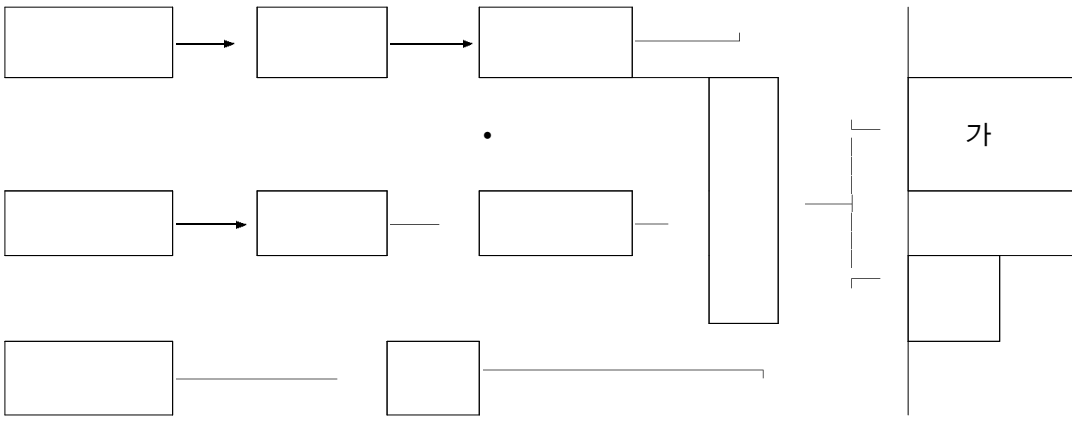
()



()



3.



4.

가

韓蜂

,

.

2

(Bailey's

industrial oil and fat products, 1982) Starhl & Pitsch Inc. (1987)

가

1 Rendering : melting at water bath, 80-90°C (: =1: 1, w/w)

2 Rendering : melting at water bath, 80-90°C (: =1: 1, w/w)

, 0.2%(v/w) (40% stock solution)

5

1

1.

Beeswax

,

. Beeswax

가

California Agricultural

Experimental Station Vansell, Bisson .

Beeswax

65

Ester Free Fatty Acid .

가

(conjugated double bond) 가

active site

.

,

.

.

가

,

.

가 , ,

.

BET

(carbon/clay),
Pore size, ()

2.

가.

(Fig. 5) He가
10-4 torr ,
가 (-20 100)
(Whatman No. 2) Glass Filter
He가

Spectrophotometer cell block hot water (80)

American Oil Chemists' Society

(Spectrophotometer: , JENWAY社, Model No. 6100) Lovibond system(Lovibond

model E tintometer: , TINTOMETER社, Model No. AF900)

Photometric color = $1.29A_{410} + 69.7A_{510} + 41.2A_{610} - 56.4A_{670}$

A : absorbance

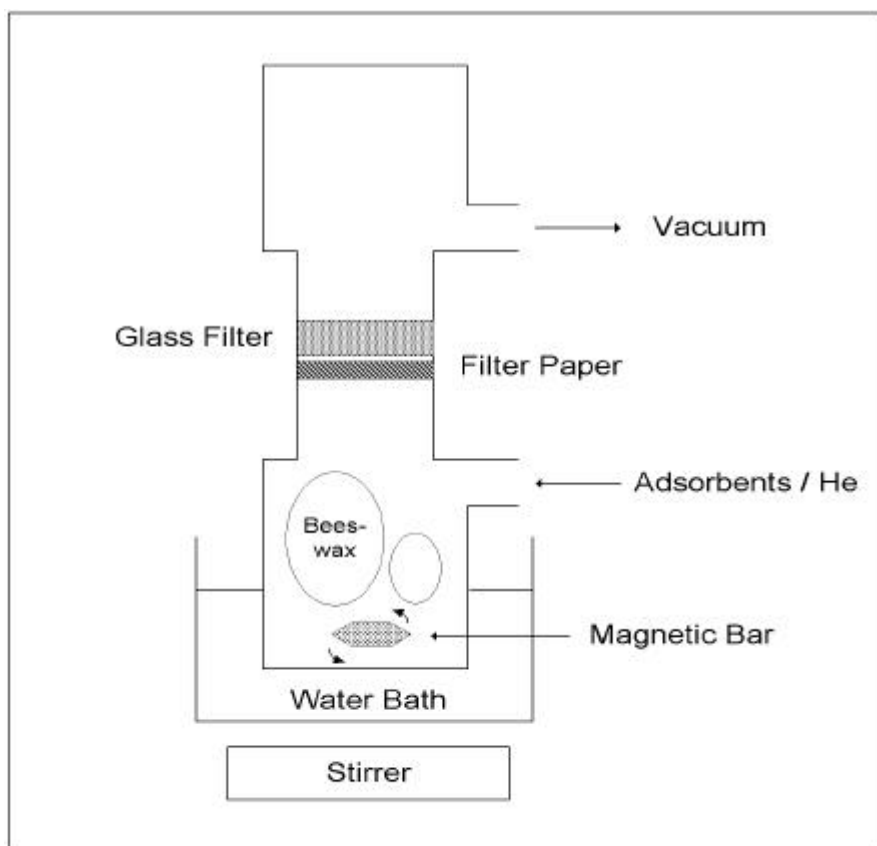


Fig. 5. Apparatus for bleaching of beeswax

2

5% 80 60 50 : 50
(Whatman No. 2)

1.

free fatty acid 가
melting-point
(Figure 5)
16

Table 16. Effects of Oxygen during Vacuum and Atmospheric Pressure

	Lovibond color	Photometric color
Vacuum Pressure	Y 9.8 R 0.9	8
Atmospheric Pressure	Y 12.8 R 1.1	10

2.

가 가
가
30 50 가 .

Table 17. Effects of Time and Color during Beeswax Bleaching

	Lovibond color	Photometric color
10 min	Y 20 R 1	13
30 min	Y 11 R 0.8	10
50 min	Y 10.5 R 0.8	9
70 min	Y 10 R 0.8	7
90 min	Y 9.2 R 0.8	5
110 min	Y 10 R 1	8

3.

가 . 가 100
(200
) , , ,
100
가

Table 18. Effects of Temperature during Beeswax Bleaching

	Lovibond color	Photometric color
60	Y 10.1 R 1	8.1
70	Y 10 R 1	7.8
80	Y 10 R 1.1	8.4
90	Y 10 R 1	8.4
97	Y 10 R 1.2	8.5
200	Y 27 R 2	13

4.

가

(oil retention) 가 cake

가 가

1 5% 가 5%

5%

가

Table 19. Effects of Adsorbents Ratio during Beeswax Bleaching

	Lovibond color	Photometric color
1%	Y 60 R 3	17
3%	Y 20 R 1	11
5%	Y 19 R 0.9	9
7%	Y 19 R 0.9	8
9%	Y 19 R 0.7	8

5. carbon / clay

가

3

oil retention

가

가

Lovibond color Blue

가

가

50:50

가

Table 20. Effects of Carbon/Clay Ratio during Beeswax Bleaching

	Lovibond color	Photometric color
carbon 0 : clay 100	Y 54 R 3	15
carbon 30 : clay 70	Y 11 R 1	10
carbon 50 : clay 50	Y 9.2 R 0.9	8
carbon 80 : clay 20	Y 12 R 1.1	9
carbon 90 : clay 10	Y 13 R 1.2	10
carbon 100 : clay 0	Y 24 R 1.8 B 0.1	11

6. Pore size

clay 1

BET method

Table 21. Surface area and Pore size of Adsorbents

	BET Surface area (m ² /g)	Average pore diameter (Å)
carbon	1256	24
clay 1	179	76
clay 2	110	144
clay 3	169	133

7.

가 . , 가
가 washing

Table 22. Effects of Phosphoric acid during Beeswax Bleaching

	Lovibond color	Photometric color
0.2%	Y 1.1	5
	Y 10 R 0.9	8

8.

Crude Beeswax ,

30 40 , 90 100 , 5%,

Carbon : Clay = 50 : 50,

가

6

1

1.

original . 10kg 10kg
1:1 80 가 .

crude beeswax
0.3% 1 (pH)가 7
beeswax bleaching agent
mixture(Carbon: Clay=1:1) 1 , 80 ,

2.

가 가
(copper) (iron) oil

type 304 stainless steel (Table 23).

pyrex (Figure 6). 50mm, 120mm

steam bubble

steam distributor 20mm glass filter disk steam
bubble bubble channeling .

Table 23. Activity of Metals Toward Soybean Oil Oxidation

Metal	Relative Catalytic Activity Toward Oxidation (Base- type 304 S.S = 100)
Copper	389
Mild steel	140
Stainless steel(T. 304)	100
Stainless steel(T. 316)	85
Nickel	75
Hastelloy B	66
Inconel	60
Aluminum	45
Pyrex	2

oil
oil (steability)가 .
oil
.
Co., GVD-050A oil rotary vacuum pump, Japan) (SINKU KINO
1.5 × 10-€
steam inlet 가 110
water reservoir steam condensation
condenser 1 condensation
. trap 3-way stopcock
가

Temperature controller Steam Water resevoir 가

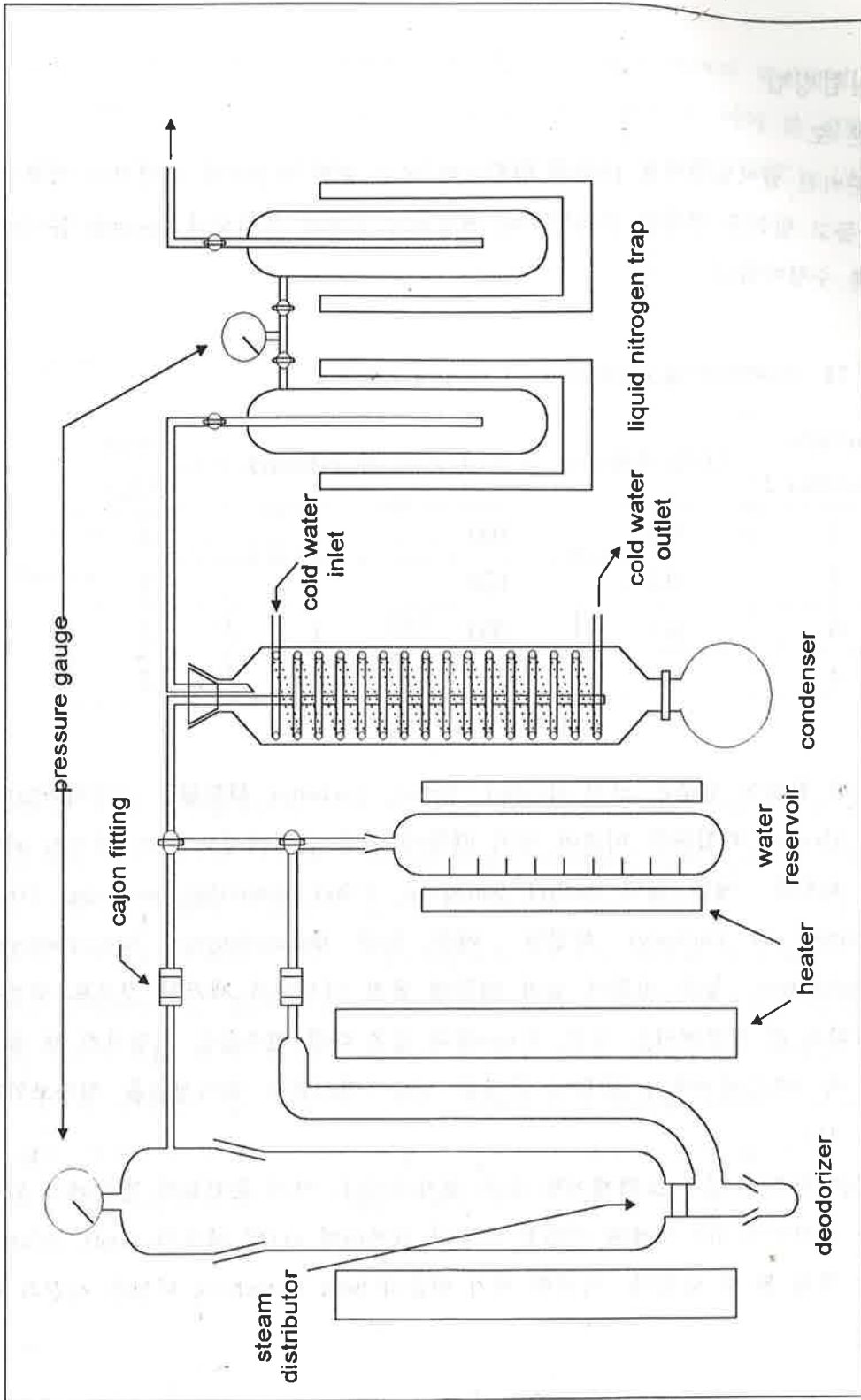


Figure 6. Apparatus of deodorizing system

3.

가.

100g

가

stear

Table 24. Deodorizing condition of sample 1, 2, 3, 4

Sample Number	()	()	(hour)	steam (%)
1	0.3	100	1	3
2	0.3	150	1	3
3	0.3	200	1	3
4	0.3	250	1	3

Alcohol, Ester, Carbonyl

Alcohol

가

Ester , Methyl benzoate, Ethyl phenethyl acetate, Ethyl decanoate, Carbonyl , Benzaldehyde, Acetophenone, p-ani saldehyde,

, Stear

, 100

50

가

(Table 24).

oil

oil

가 light color

heat bleaching

retention period 가
 AOCs soybean oil 150 , 1
 retention period 가 .

Table 25. Deodorizing condition of sample 5, 6, 7

Sample Number	()	()	(hour)	steam (%)
5	0.3	150	1	3
6	0.6	150	1	3
7	1	150	1	3

oil

oil

(,)

0.4

가

0.3

0.6

Flow balance needle

valve

가

가

Table 26. Deodorizing condition of sample 8, 9, 10, 11

Sample Number	()	()	(hour)	steam (%)
8	0.3	200	0.5	3
9	0.3	200	1	3
10	0.3	200	1.5	3
11	0.3	200	2	3

가

Steam bubble

가

. Water reservoir

3%

2 3

3

가

2

. Stean

Steau

가

Table 27. Deodorizing condition of sample 12, 13, 14, 15

Sample Number	()	()	(hour)	steam (%)
12	0.3	200	1	1
13	0.3	200	1	3
14	0.3	200	1	5
15	0.3	200	1	7

reservoir Water

4.

가.

가

- 1) (A. V) : A. O. C. S Official method Cd 3a-63 .
- 2) 가(P0V) : A. O. C. S Official method Cd 8-53 .
- 3) 가(S. V) : A. O. C. S Official method Cd 3-25 .

. Room odor test

AOCS	room odor test	24
sample	20g	100ml
가	.	5
(panel)	1	가
.	10	가
.	3	
.	4	
.		

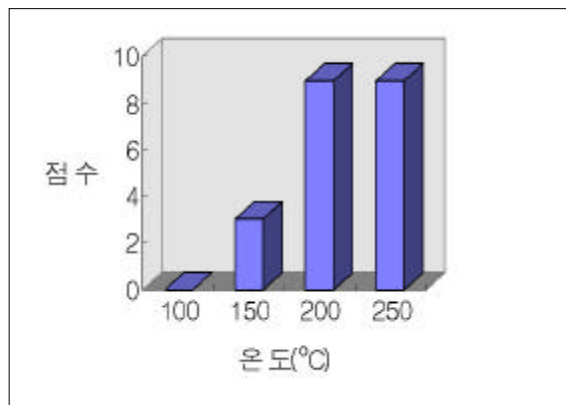
- 1) - 0
- 2) 가 - 3
- 3) 가 - 6
- 4) - 9

2

1.

Table 28. Analysis of deodorized sample 1,2,3,4

Sample Number	Acid Value	Saponification Value	Peroxide Value
1	5.65	62.21	2.99
2	4.34	62.23	2.49
3	4.05	61.65	1.51
4	4.06	61.77	2.01



7.

가

가

Alcohol, Ester, Carbonyl

250

200

oil

oil

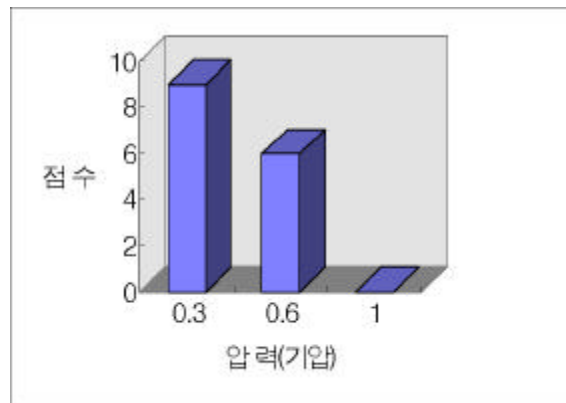
isomerization

polymerization

2.

Table 28. Analysis of deodorized sample 5,6,7

Sample Number	Acid Value	Saponification Value	Peroxide Value
5	5.56	62.34	2.67
6	6.12	62.82	3.26
7	7.65	63.98	4.87



8.

가 가

가

. Room odor test

가

가

oil

oxidation

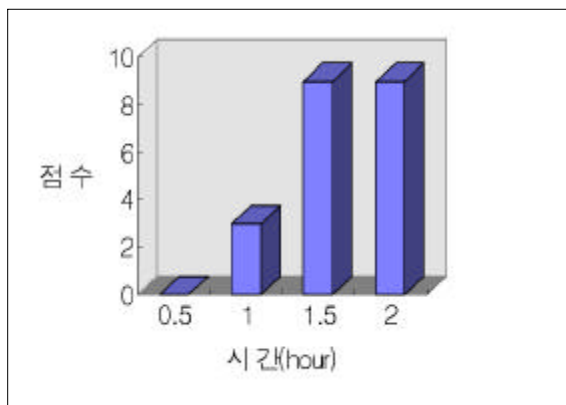
steam stripping

.

3.

Table 29. Analysis of deodorized sample 8, 9, 10, 11

Sample Number	Acid Value	Saponification Value	Peroxide Value
8	5.78	63.75	1.63
9	4.05	61.65	1.51
10	3.98	61.12	1.43
11	3.70	61.98	1.41



9.

Steam stripping

가

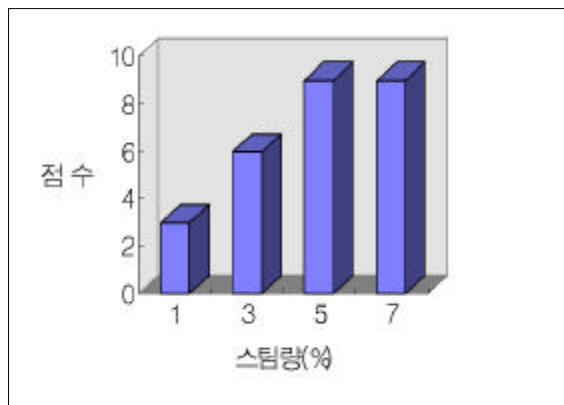
Room odor test

2 1.5

4. Stear

Table 30. Analysis of deodorized sample 12, 13, 14, 15

Sample Number	Acid Value	Saponification Value	Peroxide Value
12	5.65	63.48	2.46
13	4.05	61.65	1.51
14	3.87	61.60	1.21
15	3.88	61.72	1.26



10.

가 가 .
5% 7%
가가 .
가 Steam Steam distributor .

5.

: 200 , : 0.3 , : 1.5 2 , Steam :
5% 가 .
Room odor test

정제정도에 따른 밀랍상태



정제정도에 따른 밀랍상태



Crude 상태 (원료밀랍)



인산처리후 밀랍상태



탈색후 밀랍상태



탈취후 밀랍상태

7

1

醋

가

， 微結晶性

가

Koster Keunen社가

PG-3 beeswax

乳

濁液

． Koster Keunen

． 同社

抗

quercitrin

(10- 100ppm)

가

LD:가

가

가

whey protein-beeswax film, casein-beeswax film

産學

.
 高酸價 , 低酸價
 가 , .
*Apis mellifera*가 가
 . 가
 . Cerarica Noda社 가
 가
 가 , ,
 가 .

2 ()

Strahl & Pitsch Inc.

Koster Keunen Inc.

1. Strahl & Pitsch Inc.

가.

Candelilla wax,

Carnauba wax, Paraffin

food-grade GRAS

. Beeswax :

- 1) Natural : White and Yellow Beeswax
- 2) Synthetic and Substitute Beeswax

- 1) : Creams, Glanour products, Lotions.
- 2) : Ointments, Tablet Coatings
- 3) : Candles, Confections, Hardshell Coatings Wood and Floor

Polishes

- 1) : Tank, Rendering . Decoloring . Deodorizing .
- 2) : Melting point, Acid value,

Saponification value, Ester value, Color

. Beeswax

1)

Melting point	Acid value	Saponification value	Ester value	Saponification cloud Test	Color
62 65	17 24	89 103	72 79	65 max	Yellow or white

Test

- EPA - Toxic Substances Control Act
- Cosmetic, Toiletry & Fragrance Association

2)

Melting point	Acid value	Saponification value	Ester value	Saponification cloud test	Color
60 65	17 24	89 103	72 79	65 Max	White Yellow

2. Koster Keunen Inc.

가. Beeswax

Beeswax

	NF white Beeswax	Hydroxy- Hexanyl- Behenyl Beeswax	Isostearyl- Behenyl Beeswax	siliconyl- Beeswax
Melting Point	61- 65	62- 68	66- 72	62- 72
Acid value	17- 24	< 2	< 2	< 2
Saponification value	88- 102	80- 90	80- 90	70- 90

. :

- Eye contour Balm
- Lipstick
- Eye shadow stick
- cream

3. Formulation

Hair dressing, lotion, cold cream formulas

.

가. BRYLCREEM (HAIR DRESSING)

WATER

MINERALOIL

BEESWAX

FRAGRANCE

CALCIUM HYCROXIDE

BHT

DIMETHYL OXAZOLIDINE

MAGNESIUM SULFATE

STEARIC ACID

. W/O/W CLEANSING LOTION EMULSION

PARTS BY WEIGHT

PART1

BEESWAX	3. 00
PARAFFIN	5. 00
PETROLATUM	10. 00
MINERAL OIL	30. 00
POLYGLYCERYL RICINOLEATE	6. 00

PART2

PERFUME	0. 50
----------------	--------------

PART3

WATER	45. 50
--------------	---------------

PART4

POLYSORBATE80	2. 00
WATER	38. 00

PROCEDURE:

PART 2 ADDED TO PART 1 AT 500C

**PART 3 HEATED TO 500C IS ADDED TO THE MIXTURE SLOWLY
TO OBTAIN A W/O EMULSION.**

**THIS EMULSION IS THEN ADDED TO PART 4 AT 800C AGAIN
USING A HOMOMIXER TO OBTAIN A W/O/W EMULSION.**

US 4, 971, 721 MEIJI MILK PRODUCTIS COMPANY LTD.

. POND'S DEEP CLEANSING COLD CREAM

MINERAL OIL

WATER

BEEHVAX

CERESIN

SODIUM BORATE

FRAGRACE

CARBOMER 934

3

Test

5.0-6.0 63-65 2.5-4.0 가

1.

가. : ()

. :

.

Phase A	Purified water	34.60
	Borax	1.00
	Methyl paraben	0.25

Phase B	Light mineral oil	50.00
	Bees wax(white)	13.00
	Glyceryl monostearate	1.00
	Propyl paraben	0.15

Light mineral oil

Soybean oil

1) methyl paraben borax 75-80 water .

2) Soybean oil Bees wax, Glyceryl monostearate Propyl paraben
75-80 .

3) Phase A Phase B .

4)

. : 가 Beeswax

2.

가. : ()LG

. : Type

. Formula

(%)

	LG		
Sil 344	7.0	7.0	7.0
N- Squalane	1.0	1.0	1.0
	3.0	3.0	3.0
L- O	0.8	0.8	0.8
	2.3	2.3	2.3
Bees Wax	0.2	0.2	0.2
	4.0	4.0	4.0
(to 102)			
(98%)	8.0	8.0	8.0
가	4.0	4.0	4.0
Carbopol(2%)	15.0	15.0	15.0
TEA(10%)	4.5	4.5	4.5
(/)	0.2	0.2	0.2

* Beex Wax 2%
4% .

. : 가

1) Sun Test

-Heraeus Suntest (XENON LAMP)
- (7) (5hr) .

2) Sun Test (가)

	LG		

3.

가. : ()

. :

. **wax** Test

		()		(I)	()
가(A.V)		20.9	17.7	5.9	5.0
가	17- 24	7.5	4.8	4.0	2.5
()	62- 65	63	64	65	63.2

. Test

()

(III) >

(II) >

.

()

가

(II)

(II)가

()

가

. ,

Scale up

가

.

4.

, ,
가 가 가 .



콜드크림 적용시험



화장품 적용시험(LG화학)



화장품 Sun Test(LG 화학)

	() 가		
	() Development of Quality Control System for Red Pepper and Red Pepper Powder		
	가		()
			()
(86,821)		86,821,000	1994. 12. 31 - 1996. 11. 30 (1 11)
		-	(5)
		-	9
		-	(4)

○

- 1.
2. (NIRS) 가
3. 가

○

1. (, , , , , 가)
2. NIRS 가 가
3. 가 가

○

1. 가 () 가
2. 가
3. 가 ()

- * 1. () 8
- 2. 가 8

Processing Methods of Beeswax and its
Application to Products

가

1.

2.

3. 가