

## 總 說

## The Necessity of Blended Oil in Korean

Shin, Hyo-Sun

*Dept. of Food Science & Technology, Dongguk University*

## 한국에서 혼합유의 필요성

신 호 선

동국대학교 공과대학 식품공학과

(Received March 5, 1988)

## 1. INTRODUCTION

Fats and oils, along with proteins and carbohydrates, compose the three major nutrient groups. It is an efficient energy source and a good source of essential fatty acids. In addition, it gives a feeling of satiety after a meal and plays an important role as the carrier of fat-soluble vitamins. It is an indispensable component of various processed foods because it contributes to flavor and taste of foods with important functional properties.

Korea has a long history in oil processing industry as in cereal and milling industries. The oil industry was confined to the very primitive form in the past due to the decreasing oil consumption, underdeveloped processing technology and the lack of capital investment. Recently, however, due to the increased household income, and the change in pattern of food consumption demands more edible oils and more oil-related products. This induced the establishment of largescale oil processing companies equipped with modern facilities which enable the generation of vast amounts of processed oils and oil-based products. Therefore it is the time to change our concept that oils are one of the essential components of foods, not mere condiments, as it is in developed

countries (1).

At present Korea is absolutely short of oil resources. We are largely dependent on imported oils from edible oil-rich countries, spending lots of dollars. This phenomenon is expected to be aggravated further in the near future (2). It is, therefore, necessary to devise an efficient way of using edible oils by studying the physicochemical properties, economy, nutritional qualities, processing requirements, etc. of imported oils. Among the possible ways of effectively using our oil resources and imported oils, the best way seems to legally permit manufacturing and marketing blended edible oils. The prime reason for the uppermentioned statement is that mixtures of oils from more than two sources tend to have better physicochemical properties such as stability, frying characteristics, nutritional qualities, flavor, economy, etc., than oils from a single source (3, 12).

In this report the author is to prepare the basic materials for the legal permission of blended oils to be marketed in Korea, by providing the domestic and foreign regulations on blended oils and the quantities of production of blended oils in the countries where blended oils are legally permitted. Besides legal inspection of blended oils, several techniques which are used for qualitative and quantit-

ative identification of blended oils will also be presented in this report.

## II. THE PRESENT STATUS OF DEMAND AND SUPPLY OF EDIBLE OILS AND THE NECESSITY OF BLENDED OILS IN KOREA

### 1. Present status of edible oil demands

The total amount of oils produced annually in Korea has been rather constant at about 30,000 tons as in Table 1 (4). Sesame oil, which enjoys expensive price and higher demand than other oils, has been produced in ever increasing quantities. Contrarily, the production of rapeseed oil has been decreasing since 1981 when the production was peaked. Rice bran oil is produced at an annual rate of about 10,000 tons, marking the highest amount produced from a single source. Annual production of polished rice in Korea is estimated to be 390,000 tons a year. If total bran from rice polishing is used to extract oil, the estimated amount of rice bran oil will reach 40,000 tons a year on the basis of 12.5% oil extraction. From the calculations, only one quarter of total bran seems to be used to extract oil. Therefore, more effective use of rice bran which represents the largest of all the edible oil sources in Korea is necessary to meet the edible oil demand. In addition,

cottonseed oil, pepperseed oil, fish oil, etc. are produced in small quantities, representing approximately 10% of the total oil produced in this country.

Edible oil import is in a rapidly growing trend as shown in Table 2 (4). The total import of vegetable oil in 1983 has increased by about 10 times compared to that in 1976. On the other hand, the total amount of animal oil import has been decreasing. Among the imported vegetable oils, the quantities of soybean oil and palm oil are highest, both nearly 100,000 tons a year. Following these two, coconut oil is placed right next, about 10,000 tons a year. In addition to them, rather small quantities of cottonseed oil, corn germ oil, etc. are imported. The most important animal oil imported is beef tallow which was imported in the amount of 75,000 tons in 1978 and decreasing ever with some fluctuations in quantities. Approximately 4,600 tons of lard was imported in 1980 and the amount is also decreasing to be about 2,000 tons per year these days. The trend of decreasing animal oil import seems to be due to the fact that people tend to avoid animal fat for fear of various adult diseases.

As mentioned previously, the self-supply rate of oil calculated from amounts of domestic production and import is shown in Table 3. The rate was almost 20% until 1980. Since then the national oil production has plateaued while the amounts of oil import

Table 1. Domestic production of edible fats and oils in Korea, 1976-83(tons)

		1976	1977	1978	1979	1980	1981	1982	1983
Vegetable oils	Sesame oil	4,908	5,713	6,600	8,260	6,887	3,612	5,274	10,527
	Rapeseed oil	11,390	11,913	7,490	9,430	10,185	7,905	7,905	6,990
	Rice bran oil	6,799	6,558	14,530	16,670	10,886	13,875	13,920	11,214
	Cottonseed oil	517	315	390	520	390	409	384	-
	Pepperseed oil	513	563	370	720	790	830	866	-
	Miscellaneous	2,364	2,053	920	760	8,071	710	79	1,293
	Subtotal	26,115	27,115	30,300	36,360	37,209	27,341	28,428	30,024
Animal fats	Marine oil	-	-	1,150	1,250	4,119	4,326	1,485	2,224
	Total	26,491	27,115	31,450	37,610	41,328	31,667	29,913	32,248

Table 2. Amount of imported edible fats and oils in Korea, 1976-83 (tons)

		1976	1977	1978	1979	1980	1981	1982	1983
Vegetable oils	Soybean oil	16,794	18,528	28,630	59,360	68,229	64,638	80,881	104,832
	Palm oil	3,180	2,112	2,720	9,840	33,371	54,053	82,349	91,668
	Olive oil	-	-	10,970	6,510	4,380	8,528	19,002	11,703
	Cottonseed oil	3,535	-	1,320	1,290	1,365	2,480	2,483	-
	Corn germ oil	-	3,614	4,200	4,780	4,390	8,210	5,821	-
	Miscellaneous	-	3,948	1,740	2,140	9,266	6,322	8,273	21,565
	Subtotal		23,509	28,202	49,580	83,820	121,001	143,231	198,809
Animal fats	Beef tallow	58,834	73,057	74,220	67,810	31,255	54,413	65,168	44,646
	Lard	1,950	2,772	2,160	2,200	4,677	2,000	2,000	-
	Miscellaneous	-	-	-	3,060	901	5,593	-	2,958
	Subtotal		60,784	75,829	76,380	73,070	36,838	62,006	67,168
Total		84,293	104,031	125,960	156,890	157,834	205,237	265,977	277,307

Table 3. The self-supply rate of edible fats and oils in Korea, 1976-83(tons)

	1976	1977	1978	1979	1980	1981	1982	1983
Domestic production	26,491	27,115	31,450	37,610	41,328	31,667	29,913	32,248
Imported amount	84,293	104,031	125,960	156,890	157,834	205,237	265,977	277,370
Total	110,784	131,146	157,410	194,500	199,162	236,904	295,890	309,618
Self-supply rate(%)	23.9	20.7	19.9	19.3	20.8	13.4	10.1	10.4

has rapidly increased to meet the growing demand of oil. Presently the self-supply rate of edible oil is only about 10%.

## 2. The future prospect of edible oil demand

The daily per capita consumption of edible oil was 16.9g in 1969 and it increased by 1.4 times in 1983 to 23.5g. Energy intake through edible oil consumption accounts for about 10% of total energy intake (2). The figure is quite poor compared with the those of U.S.A. and Japan having about 45% and about 25%, respectively. The ideal ratio of energy contribution through edible oil to total energy intake is not easily defined because it is dependent on age,

sex, the pattern of life, and eating habit. It is, however, generally accepted that 20-25% is ideal. Assuming that the total daily requirement of an average Korean is 2,700 Kcal and that edible oil contributes 25% of total energy intake, the daily per capita oil consumption will be 75g. If visible oil accounts for 50% of the figure, visible oil consumption will be 37.5g. Since the estimated total population of Korea is fifty million by the year 2,000, the total estimated demand of oil will be 690,000 tons (5). This figure is approximately twice of the amount of total visible oil consumed in 1983. Even though the domestic oil production triples by the year 2,000, it would be inevitable to import 60,000 tons of oil to meet the domestic oil demand.

### 3. Necessity of blended oils

As aforementioned, our edible oil self-supply rate is about 10% and the rest should be imported from foreign countries. Such a phenomenon is expected to be aggravated further in the future due to natural increase in the total population and to the expected increase in per capita oil consumption in the coming days. Therefore it is necessary to take a measure to meet the growing demand of edible oils.

Two possible measures can be considered. The first is to augment domestic production of edible oil and the second is to take steps to efficiently use imported oils. An easy and practical alternative is the manufacturing and marketing of blended oils. Blended oils made by mixing oils from more than two or more different oil sources are known to have superior qualities, e.g., lower price, better nutritional quality, better physicochemical properties, etc.

Sesame oil has been the special favorite of Koreans and has represented the edible oils from ancient times. Sesame oil is loved because of its peculiar flavor and it has mainly been used as a flavoring condiment. Therefore if an oil mixture made by blending a small amount of sesame oil and a lot of other oil with lower price is still able to satisfy our demand as flavoring condiment, we do not have to use expensive pure sesame oil to simply get sesame flavor. In fact we import approximately 8,000 tons of sesame seed a year which costs 6,000,000 dollars.

The price of oils from other sources than sesame seeds ranges 1,400-1,700 won per liter while that of sesame oil is 17,000 won for the same amount. Accordingly sesame oil mixed with other oil proper ratio will have cheaper price to give us a great economic advantage. In 1984, for example, Japanese firms produced 24,000 tons of pure sesame oil and about 40,000 tons of sesame oil blends (6). This simple example alone is enough to urge us to re-examine our present status seriously.

As pointed out in the preceding part, the energy supply through oil consumption represents about 10% of total daily energy supply of an average Korean. This percentage should be increased. How-

ever, the increase in the quantity should be parallel with the upgrading of the quality. In other words, much of the animal oil should be replaced by vegetable oil as is practiced in most developed countries. Any defects indigenous to an oil from a single source can be corrected by mixing oils from multiple sources. The authors firmly believe that blended vegetable oils will improve public health because the quality and quantity of oil is directly related to adult diseases.

According to the prospect of our future edible oil demand, supply, and per capita consumption of edible oil in Korea, it is wise to permit production and marketing of blended oils in order to effectively use imported oils more effectively. In addition, price, nutritional qualities, and other properties of oil are undoubtedly improved by blending oils from different sources.

## III. REGULATIONS ON BLENDED OILS IN DIFFERENT COUNTRIES

### 1. Korea

The article #22 of Korean Food Hygiene Law states that "manufacturing of food or food additives listed by the Minister of Health and Social Affairs have to obtain permission prior to the production, either from the Minister, or from the Mayor of Seoul, or from the Mayor of cities under the direct control of the government, or from the Governor of the Provinces". The same is true when the manufacturers want to make any modifications of their product or to make any additions to their list of products (7). It is doubtless that a legal permission is mandatory for the manufacturing of any food items or food additives. Therefore it can be easily deduced that the same is true to edible oils.

Korean Food Hygiene Law dictates the specifications and the standards of identity for all foods sold in the country. The kinds of edible oils that the law bears their specifications and the standards of identity are 15; they are rapeseed oil, sesame oil, rice bran oil, soybean oil, peanut oil, olive oil, palm oil, palm stearin, palm olein, palm kernel oil, copra oil. The

law, however, fails to comment on blended oils mixed in certain ratios of uppermentioned 15 legal edible oils. In other words, the in Korean Government does not allow the manufacturing and marketing of blended oils. The primary reason for not allowing blended oils is that we do not have a technical knowledge to tell a pure sesame oil from blended ones. Korean people are extremely sensitive for the pure sesame oil. If blended sesame oil is legally permitted, due to the inability of determining sesame oil content, consumers may be cheated by conscienceless mixers.

In fact, members of the Food Hygiene Committee of the Ministry of Health and Social Affairs, after many heated discussions about the pros and cons of legal permission of blended edible oils, concluded against it for the aforementioned reason.

## 2. Japan

Japanese government specifies the standards of

identity of various edible oils in JAS(Japanese Agricultural Standard) (8). Standards of identities of crude coconut oil, safflower oil, soybean oil, sunflower oil, corn germ oil, cottonseed oil, sesame oil, rapeseed oil, rice bran oil, kapok oil, peanut oil, olive oil, palm oil, palm olein, palm stearin, palm kernel oil, coconut oil, and blended edible oils are established. Blended edible oils can be manufactured and marketed in Japan. Japanese government classifies blended edible oils into three major groups as blended oil, purified blended oils, and blended salad oils. The Japanese law requires the display of the class of the quality and other necessary informations on the label. The method of display and prohibitions are also listed in the law as in Table 4.

## 3. Taiwan

Oil blends manufactured by mixing various vegetable oils of good quality are listed in CNS (Chinese National Standard) (9). Taiwanese government classi-

Table 4. Standards of blended edible oils in Japan (JAS #39)

	Blended oils	Purified blended oils	Blended salad oils
I. Quality			
1) General	Generally clear liquid with good flavor	Clear liquid with good flavor	Clear liquid with good taste and flavor
2) Color	Good color	Good color	Y ≤ 35, R ≤ 3.5 (Lovibond determination, 133.4mm cell)
3) Moisture and Impurities	≤ 0.20%	≤ 0.10%	≤ 0.10%
4) Cooling test	Not applicable	Not applicable	Should be clear for 5.5 hours
5) Acid value	≤ 0.50 (sesame oil blends ≤ 0.20)	≤ 0.20	≤ 0.15 (olive oil blends ≤ 0.40)
6) Unsaponifiable matter	≤ 1.5% (sesame oil blends ≤ 2.0%; rice bran oil, purified rice bran oil and rice bran salad oil blends ≤ 3.0%; sesame oil and rice bran oil blends ≤ 3.5%)	≤ 1.5% (blends of rice bran oil, purified rice bran oil or rice bran salad oil ≤ 3.0%)	The same as the left

7) Net weight	More than displayed on the label	The same as the left	The same as the left
<hr/>			
<b>II. Labelling</b>			
1) Information	All the following informations should be displayed.		
	1) Product name	2) Source of the oil	3) Net weight
	4) Date of manufacture (the imports without known date of manufacture should bear date of import)		
	5) The name, title and address of the manufacturer or distributor (import in the case of imports)		
2) Method of display	1. 1) through 5) of 2, 2) should meet the following requirement.		
	1) Product name should be described as "edible blended oil".		
	2) Source of the oil should be described as in A and B in order.		
	A. Sources of oil should be listed in order of its prevalence.		
	Descriptions are as follows. "edible safflower oil", edible soybean oil", edible sunflower oil", "edible corn oil", "edible cottonseed oil", "edible rice bran oil", "edible sesame oil", "edible peanut oil", "edible olive oil", "edible palm oil", "edible palm olein", "edible palm stearin", "edible palm kernel oil", "edible coconut oil".		
	B. Food additives		
	(1) Food additives listed on appendix Table 2 (except for those listed on appendix Table 5) of enforcing regulation of Food Hygiene Law (decree #23 of the Ministry of Public Welfare) and those used to prevent oxidation of oil should be described by their common names or as "antioxidant"		
	(2) Those additives listed on appendix Table 5 of the enforcing regulation should be described by their common names or by a material containing the additives.		
	3) Net weight		
	Content should be described in grams or in kilograms.		
	4) Date manufactured		
	One of the following format is acceptable.		
	a. Showa 47, 7, 1.      b. 1972, 7, 1.		
	2. All the display should be marked on the containers or on the package and be readable with great ease.		
<hr/>			
<b>III. Prohibitions</b>			
	The following informations should not be displayed on labels.		
	1. Any word or statement implying specific source of oil. However, the following exceptions are acceptable.		
	1) The source of an oil occupying 30-60% of total content can be implied by its name on the label.		
	2) The source of oil occupying more than 60% of the total content can be used as product name with the prefix "blended". In these cases the % content of the oil should be described on the center of the container or on the package.		
	2. Any word or statement contradicting any of II.		
	3. Any letter, picture or other descriptions which may mislead consumers.		
<hr/>			

fies blended edible oils as Japanese government does. Taiwanese Food Hygiene Law requires the display of the quality grade and content. Labelling and other standards are as in Table 5.

#### 4. The U.S.A.

CFR (Title 21) states the requirements for mixtures of edible fat or oil and olive oil. Part 102 of Chapter 1 covers a mixture of edible fats and oils containing less than 100% and more than 0% olive oil. The descriptive name for the product should

meet the requirements in section 5 of part 102 (10).

When the label bears any representation, other than in the ingredient listing, of the presence of olive oil in the mixture, the descriptive name shall be followed by a statement expressing the percentage of olive oil in the product. The percentage of a characterizing component must be declared on the basis of its quantity. The percentage should be described by the word "containing (or contains) percent (or %)" with the first blank filled in with the % expressed as a whole number not greater than the actual percentage and the second

Table 5. Standards of blended oils in Taiwan (CNS 5181)

	Blended vegetable oils	Purified blended vegetable oils	Blended vegetable salad oils
1. Materials covered by this standards; blended edible oils made by mixing oils of good quality (passed the National regulations).			
2. Quality: The quality should comply with the contents of the Table.			
1) General	Generally clear liquid with good flavor	Clear liquid with good flavor	Clear liquid with good taste and flavor
2) Color	Good color	Good color	Y 35, R 3.5
3) Cooling test	Not applicable	Not applicable	Should be clear for 5.5 hrs.
4) Moisture and volatiles	≤ 0.20%	≤ 0.10%	≤ 0.10%
5) Impurities (%)	≤ 0.1	≤ 0.1	≤ 0.1
6) Acid value	≤ 0.50 (sesame oil blends 2.0)	≤ 0.20	≤ 0.15 (olive oil blends ≤ 0.40)
7) Unsaponifiable matter (%)	≤ 1.5 (sesame oil blends ≤ 2.0; rice bran oil, purified rice bran oil, rice bran salad oil blends ≤ 3.0; sesame oil and rice bran oil blends ≤ 3.5)	≤ 1.5 (rice bran oil, purified rice bran oil, rice bran salad oil blends ≤ 3.0)	The same as the left
8) Copper (ppm)	≤ 0.1	≤ 0.1	≤ 0.1
9) Mercury (ppm)	≤ 0.05	≤ 0.05	≤ 0.05
10) Arsenic (ppm)	≤ 0.1	≤ 0.1	≤ 0.1
11) Lead (ppm)	≤ 0.1	≤ 0.1	≤ 0.1
12) Aflatoxin (ppm)	≤ 0.025	≤ 0.025	≤ 0.025
3. Net weight; should not be less than that displayed on the label.			
4. Packaging and labelling: the products should be contained in cans or in glass bottles. The source of constituting oils and their and percentage should be described.			
5. Inspection: blended edible oils are inspected by CNS 3639 (edible vegetable oil inspection law).			

blank filled in with the name of the component.

#### IV. THE AMOUNTS OF BLENDED EDIBLE OILS MANUFACTURED (IN JAPAN)

The kinds of blended edible oils produced in Japan are various as shown in Table 6 (11). The oils used to make blended edible oils are primarily

sesame oil, soybean oil, rapeseed oil, corn germ oil, rice bran oil, safflower oil, cottonseed oil, sunflower oil, olive oil, etc. However, the blending ratios are not available in the literature.

The total amounts of blended edible oils produced in Japan are as shown in Table 7 (11). The total amounts of vegetable oil and blended edible oils produced in Japan are increasing at a steady rate.

Table 6. Kinds of blended edible oils produced in Japan

Classification	Blended edible oils
Blended oils	Sesame oil + soybean oil
Purified blended oils	Soybean oil + rapeseed oil, Rapeseed oil + soyben oil
Blended salad oils	Rapeseed oil + corn oil, Rapeseed oil + soybean oil, Soybean oil + rapeseed oil, Soybean oil + cottonseed oil, Rice bran oil + safflower oil, Soybean oil + rapeseed oil + safflower oil, Rapeseed oil + cottonseed oil + castor oil, Rapeseed oil + cottonseed oil + corn oil, Soybean oil + cottonseed oil + sesame oil, Sunflower oil + corn oil + safflower oil, Rapeseed oil + corn oil + safflower oil, Castor oil + cottonseed oil + soybean oil + rice bran oil, Sunflower oil + cottonseed oil + soybean oil + corn oil, Corn oil + olive oil + sunflower oil + corn oil, Sunflower oil + soybean oil + corn oil + cottonseed oil

Table 7. The total amounts of vegetable oils and blended edible oils produced in Japan (tons)

	1980	1981	1982	1983	1984	1985
Total vegetable oil produced (A)	1,096,801	1,184,124	1,219,426	1,265,371	1,266,659	1,332,830
Blended oils	8,749	9,622	9,622	9,644	9,144	9,202
purified blended oils	44,252	45,041	44,130	43,056	41,950	43,360
Blended salad oils	424,276	464,298	493,945	498,560	529,259	536,125
Total blended oils produced(B)	477,277	518,468	547,697	551,260	560,353	588,687
Ratio (A/B)	43.5	43.8	44.9	43.6	44.2	44.2



Table 8. Comparison of prices of blended and unblended oils depending on the material of the containers (Yen/100g)

Kinds of oil	Plastic container			Glass container			Metal container		
	Hi	Lo	Av	Hi	Lo	Av	Hi	Lo	Av
Sesame oil	125	105	114	194	129	160	138	119	132
Blended oil (Sesame oil + soybean oil)	98	75	82	109	76	91	102	82	86
Soybean salad oil	54	42	46	72	60	63	67	54	59
Rapeseed salad oil	40	30	34	45	38	41	47	39	36
Safflower salad oil	109	87	94	114	117	128	125	100	110
Blended salad oils									
Soybean oil + rapeseed oil	37	29	32	42	24	37	40	30	35
Rapeseed oil + soybean oil	62	30	39	47	41	40	65	41	49
Rice bran oil + safflower oil	87	54	62	95	73	86	93	68	78

Hi; highest, Lo; lowest, Av; average

43-44% of total vegetable oils is used to make blended edible oils. Blended salad oil occupies the most of the blended edible oils produced in Japan. As illustrated above in Table 7, the amounts of blended oils occupies a large part of total vegetable oils produced in Japan (11). This should be because blended oils have better physicochemical properties, better nutritional qualities and better economy than unblended ones.

Table 8 shows the comparison of prices of blended oils and unblended ones in different kinds of container (11). It is apparent from the Table that oil prices are quite different depending on the kinds of its containers and that plastic container is most economical among the three (plastic, glass, metal) while glass container is least economical. The Table also shows that blended oils are generally cheaper and that the prices of oils vary depending on the mixing ratio of constituting oils.

#### V. TECHNIQUES FOR IDENTIFICATION OF BLENDED OILS

The identification of edible oils and fats has received a great deal of attention. Food and Agicul-

ture Organization (FAO)/World Health Organization (WHO) Codex Alimentarius Committee on Fats and Oils has considered to use fatty acids composition for the authentication for commercial fats and oils (13). A simple, graphic procedure (14) and computer programs (15, 16) using fatty acid composition data have been put forward for identification of fats and oils.

A simple, graphical procedure for using the Codex Committee's fatty acid composition standards have not been found to conflict with some presently accepted mandatory standards such as iodine value, refractive index and saponification value. The ranges of fatty acid composition contained are, however, so wide that several samples could be classified under more than one type of oil.

To overcome the problem of insufficient information from fatty acids, the composition of the unsaponifiable fractions such as sterol content and tocopherol content were determined and computer analyzed to evaluate the applicability by generalized least squares estimator and weighted least square estimator (17). The model was tested on 93 samples containing known amount of sunflowerseed oil, groundnut oil, soybean oil, cottonseed oil, maize oil,

olive oil and palm oil. Of these samples 75 were binary mixtures, seven were ternary mixtures, one contained seven oils and 10 were pure oils. Satisfactory results were obtained with 79 of 93 samples (85%). The use of this model is considered superior to the matching of a fatty acid composition, but the model still needs a lot of development.

It is reported that cloud point, refractive index, polymerization have changed correspondingly to the change of component oil proportion in blended cooking oil when component oils are known (3, 18). Dielectric constant and polar component content, however, could not discriminate the kinds and proportion of component oils. It was shown that diene and triene content determined by spectroscopic methods was not suitable for more saturated oils such as palm oil.

## VI. CONCLUSION

Self-supply rate of edible oils in Korea is about 10% and the rest is imported. Such an undesirable situation is expected to get worse in the coming days. Therefore we need to take a measure to efficiently utilize imported oils.

A desirable and practical measure seems to be the legal permission of the manufacturing and marketing of the blended edible oils in Korea. In fact, manufacturing and marketing of blended edible oils are legally permitted in such countries as Japan and Taiwan where edible oil resources are as poor as Korea and eating pattern of people is similar to that of Korean. Both countries have established detailed standards of identity and strict labelling regulations about blended edible oils. It is especially interesting to note that blended edible oils occupy 43-44% of total vegetable edible oils produced each year in Japan. Manufacturing and marketing of blended edible oils are also permitted in the countries that have rich edible oil resources like U.S.A. The countries have also established the standards of identity of blended edible oils.

Concerning Authorities body of Korea (Ministry of Health and Social Affairs and municipals), food industry and food scientists in Universities and various

research institutes all agree in principle that the manufacturing and marketing of blended edible oils be legally permitted. However, the primary reason for not permitting blended oils is because sesame oil-loving Korean people might blame the Government for publicly permitting the adulteration of sesame oil. As mentioned earlier, since neither the government, food industry, nor university have the technical knowledge to analyze the purity of sesame oil, it is almost impossible to protect consumers from being cheated by conscienceless manufacturers.

Therefore a compromised recommendation is that blended oils should be made and marketed with the clear description of its contents. Blended sesame oil can be permitted any time when we acquire a proper technique to analyze the purity of sesame oil. When blended edible oils are permitted, the labels of the container should be required to properly display the % content of each constituting oil. The labelling has to be closely supervised by the Government for the best profit of consumers.

It is, at the same time, necessary to educate consumers that blended oils are cheaper and have better physicochemical properties and better nutritional qualities than unblended ones. The responsible people should take active part in educating consumers that, since sesame oil is being used as flavor-enhancing condiment, they do not need to use expensive pure sesame oil as long as blended oils can impart sesame oil flavor that they care for.

## REFERENCE

1. Shin, H.S., Food Science (Korea): 19 (4), 111 (1986)
2. Shin, H.S., Food Science (Korea): 18 (4), 19 (1985)
3. Yoon, S.H., S.K. Kim, Y.K. Teah, K.H. Kim and T.W. Kwon, Korean: J. Food Sci. Technol., 18, 329 (1986)
4. Korea Rural Economic Institute, Food Balance Sheet (1984)
5. Kwon, T.W., Food Industry (Korea): 76, 30 (1984)
6. The Japan Oil Chemists' Society, Personal

- Communication (1986).
7. Ministry of Health and Social Affairs, Republic of Korea, Food Hygiene Law (1986)
  8. Japanese Agricultural Standard, Section 10: Article 21-39 (1986).
  9. Chinese National Standard, 7525, N5181 (1986).
  10. Code of Federal Regulations, Title 21, Part 102, Subpart B-102.37 (1986)
  11. Japan Food Industrial Center, Statistical Yearbook (1985)
  12. Sakada, M., Y. Takahashi and M. Sonehara: J. Amer. Oil Chem. Soc., 62, 449 (1985)
  13. Joint FAO/WHO report of the tenth session of codex alimentarius committee on fats and oils, London, December (1978)
  14. Spencer, G.F., W.F. Kwolek and L.H. Princen: J. Amer. Oil Chem. Soc., 56, 972 (1972)
  15. Spencer, G.F., S.F. Herb and P.J. Gorminsky: J. Amer. Oil Chem. Soc., 53, 94 (1976)
  16. Kacprzak, J.L. and V.R. Higgins: Anal. Chim. Acta, 112, 443 (1979)
  17. Van Niekerk, P.J. and A.E.C. Burger: J. Amer. Oil Chem. Soc., 62, 531 (1985)
  18. Yoon, S.H., S.K. Kim, M.G. Shin and K.H. Kim: J. Amer. Oil Chem. Soc., 62, 1483 (1985)