

특집 제1회 김치의 과학과 산업화 심포지움

김치 산업화의 국제화를 위한 제품 표준화 방향

-김치 국제규격 추진경위 요약-
-김치 Codex 규격 제정필요성 및 규격안-

박 무 현

한국식품개발연구원 표준화연구부장

1. 시작동기

- '94. 5 : 北京 코덱스아시아지역조정회의(94. 5. 24~27) 참가이후 日本의 김치 코덱스규격화에 대한 우려가 언론에 집중 보도됨에 따라
- '94. 6 : 농림수산부는 韓食研에 김치 등 전통식품에 대한 국제규격화 연구추진을 지시

2. 협의과정, 사전설명, 의제채택

- '94. 10 : 김치의 Codex 규격제정 사유서 작성
- '94. 11 : 김치의 Codex 규격 초안 작성
- '94. 12 : 국제규격 제정 절차 및 김치규격제정 필요성 파악, 제출시기, 의제채택방법 협의를 위한 FAO Codex사무국(로마) 방문
 - 면담자 : FAO Codex위원회 사무국 사무차장(Mr. Randell), 식품표준담당관(Yamada)
- '95. 2 : 김치의 인지도 제고 및 국제분위기 조성을 위한 국제회의(3차 Codex 수출입 검사 및 인증분과위원회, 호주 캔버라) 참가 및 홍보용 팜플렛 배포
 - Codex 위원회 주요인사 면담(CAC의장, 부의장 및 사무국장 등 3명) 및 김치홍보
 - 일본의 김치 Codex규격화 추진상황 탐문(농림수산성 식품유통국 계장 Mr. A. Miura)
 - 김치 홍보책자(농협과 공동으로 신규 제작) 배포
- '95. 7 : 김치의 인지도 제고 및 국제분위기 조성을 위한 국제회의(21차 Codex 총회, 이태리 로마) 참가 및 홍보용 팜플렛 배포
 - CAC 차기 의장단 및 사무국 관계관 면담 : 차기의장 (Dr. Pothisiri), 아시아 지역조정 위원회 의장(Hayasi) 및 CAC사무국 관계관(Byron, Yamada) 등

-김치 홍보책자 배포

- 태국, 말레이시아 등 일부 주요 아시아국가 대표들에 대한 개별접촉 및 김치규격화 계획 설명
- '95. 7 : 김치 Codex규격안 이해관계자 의견조사
 - 조사처 : 학계, 업계, 관련기관 등 총 26개소
- '95. 9 : 김치 Codex규격 초안에 대한 연구심의회 개최
 - 참석자 : 한국식품개발연구원 연구심의위원 12명
- '95. 9 : 김치 Codex규격안 전문가 협의회 개최
 - 참석자 : 학계, 업계 등 총 8명
- '95. 10 : 김치 Codex규격안 및 규격제안설명서 제검토 의견조사(농림수산부)
 - 조사처 : 학계, 업계, 관련기관 등 총 9개소
- '95. 11 : 김치 Codex규격안 및 규격제안 설명서 심의회 개최(농림수산부)
 - 참석자 : 학계, 업계, 관련기관 등 총 16명
- '95. 12 : 김치 규격안 Codex 사무국 송부
- '96. 1 : 김치 규격의 Codex규격 의제채택 활동 및 김치 홍보를 위한 FAO사무국 방문
 - 면담자 : A. Randell, Y. Yamada, D. H. Byron
- '96. 2 : 김치 홍보 및 아시아회원국 협조요청을 위한 아시아 회원국 방문

3. 김치 Codex 규격화 진입

- 김치 Codex 규격화 필요성은 지난 10차 Codex 아시아 지역 조정위원회에 13번 의제로 상정
- 제 10차 Codex 아시아지역 조정위원회에서 심의
 - 기 간 : '96. 3. 5(화)~'96. 3. 8(금)
 - 장 소 : 일본국립암센터, 동경(일본)
 - 참석자 : 14개국 대표단, 2개 업저버 국가 대표단(호주, 미국), 7개 국제기구(CI, ICA, ILSI,

UNU, FAO, WHO, Codex 사무국) 등 약 130명

－ 회의경과

- 한국측 수석대표(신정승 참사관, 주일한국대사관)는 김치 Codex 규격화 필요성 제안 설명
- 현지집에서의 김치 국제규격화에 대하여 일본 및 중국 대표단은 이견 제시
- 그러나, 몽골, 인도네시아, 말레이시아, 필리핀, 태국, 싱가포르 등 6개국 대표단은 한국측 제안을 지지
- 과반수 이상의 지지에 따라 의장은 김치가 Codex 규격화 단계에 진입하였음을 선언

○ Codex 집행이사회에서 김치 규격화 필요성 추인('96. 6. 4)

－ 스위스 제네바

○ 우리 정부가 제안한 김치 Codex 규격 제정필요성 및 규격(안) 전문 별첨

4. 앞으로 진행

현재 한국이 제안한 김치규격의 제정 필요성이 Codex 집행이사회에 추인됨에 따라 Codex 사무국은 한국이 제출한 규격 초안을 회원국에 송부하여 의견을 물어 '97. 12 ~ '98. 1에 개최예정인 Codex 아시아 조정위원회에 상정하여 그 내용을 심의한다. 심의과정에서 예상되는 쟁점은 다음과 같다(별첨).

본 규격안이 통과될 경우 Codex 총회나 집행이사회에 심의를 거쳐 “규격안”으로 확정된 후 다시 각 회원국의 의견을 들어 수정한 후 총회에서 심의 “Codex 규격”으로 확정 공포한다.

첨 부 1.

김치규격 심의과정에서 예상되는 주요 쟁점 및 대응논리
(97, 12 Codex 아시아조정위원회 대비)

쟁점 1

김치는 아직 상품화 정도가 미흡하며 교역량이 적어 규격화 요건에 미흡하다.

대응논리

한국의 경우, 현재 산업적으로 생산하는 김치는 140,000 M/T에 이르며, 매년 9.6% 성장되고 있음. 한편, '95년 한국은 일본, 스페인, 미국 등 여러나라에 12,000톤, 5,100톤의 김치를 수출한 바 있으며, 수출량이 매년 20% 이상씩 증가하고 있음.

김치의 국제 교역량이 증가하는 반면, 대부분의 국가는 김치 수입 검사기준을 보유하고 있지 않으며, 이에 따라 김치 수출입과 관련된 분쟁가능성이 있음. 한국의 주요 수출대상국인 일본에는 김치규격이 없어 김치 통관 검사시 유사식품(절임류)의 기준을 적용하여 김치의 품질을 보장받기 어려움(국내외 조사결과 특별한 방해사례 없음).

쟁점 2

건강의 관점과 위해로부터 소비자 보호가 시급한 품목이 아니므로, Codex 규격 제정목적에 부합되지 않는다.

대응논리

김치의 안정성은 젖산발효에 기인하며 유통 중에도 젖산발효가 진행되나 소비자는 구매 당시에는 김치의 과숙 여부를 판단하기 어려움.

김치 생산중 배추 등의 원료 및 공정 특성상 이물질 등이 혼입될 우려가 있어 규제가 필요함.

적절한 원료선택 및 세척을 행함으로써 김치에서는 중금속이나 농약이 문제점으로 간주되지 않으나 고춧가루 제조시 노후화된 설비에서 유래하는 철(Fe)은 문제가 될 수 있음.

쟁점 3

국가법규와 그 변경으로 인한 국제교역상 명백한 방해가 있는 품목인가?

대응논리

일본의 경우 김치규격이 없어 수입 김치 통관 검사시 유사 식품(절임류)의 기준을 적용하여 김치의 품질을 보장하기 어려움(국내외 조사결과 특별한 방해사례 없음).

쟁점 4

김치를 피클, 쪄게모노, 포채 등의 유사식품과 규격을 분리하여 설정할 필요가 있는가?

대응논리

과채류 가공제품은 종류에 따라 사용하는 원료 및 가공 방법에 큰 차이가 있다. 또한, 종류에 따라 최종 제품의 저장성 및 관능특성이 상이하다.

그러므로 방대한 범위의 식품군을 동시에 포괄할 수 있는 규격설정은 거의 불가능한 것으로 보인다.

김치의 경우 현재 규격화가 진행중인 피클과는 전혀 상이한 품질기준을 필요로 한다. 특히, 김치는 상대적으로 산도 및 염도가 낮은 제품인 반면 피클은 일반적으로 고산도 및 고염도의 특성을 가지는 포괄적인 제품군을 의미함.

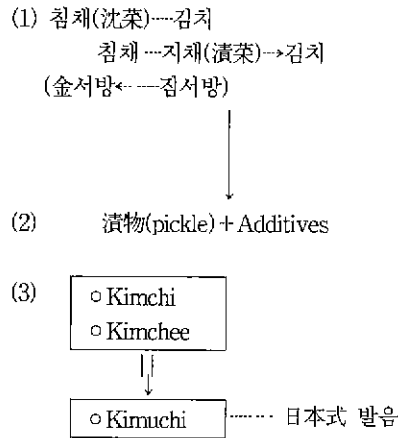
대응논리 2

Raw materials 차이

	Kimchi	Pickle
Main ingredient	○ Vegetables (Mainly cabbage)	○ Vegetables
Spice & Seasonings	○ Spice and seasoning mixs - Thin Julienne radishes (cut) - Red pepper powder or paste - Pickled fish and oyster - Aromatic vegetables (Water cress, Indian mustard leaves, Welsh onino)	○ Seasoned liquid - Salt - Vinegar - Others

쟁점 5

Kimchi와 Kimuchi의 어원 및 적정 표기방법은



별 첨 1.

- 김치의 Codex 규격화를 위한 필요성에 대한 제안문

KIMCHI AND THE NEED FOR STANDARDIZATION

(제안문 : ASIA 조정위원회)

1. Introduction

Kimchi is fermented vegetable product which has sour, hot, salty, somewhat sweet and carbonated taste, and characteristic texture. *Kimchi* is usually consumed as a favorable side dish with cooked rice or noodles and it is sometimes used as an ingredient in preparing other types of foods. *Kimchi* has close fellowship with rice which is major staple food consumed by 3 billion people or 50% of world population. Thus, *kimchi* is considered to have huge potential market worldwide.

In its traditional form, *kimchi* has been produced and consumed since the ancient times. And the present form was developed in Korea in the 18th century. *Kimchi* has remained largely unchanged and is served as a savoury side dish at most Korean meals. *Kimchi* has now become popular in many parts of the world including Japan, other Asian countries, Spain, and the United States. *Kimchi* was also designated as one of the official foods in recent Olympic Games and Asian Games.

Besides *kimchi*, several kinds of fermented vegetables such as sauerkraut, pickled cucumber, Japanese Tsukemono are known worldwide. But, *kimchi* shares little common points with other fermented vegetables. *Kimchi* is a mixed vegetable product of which the acidity is distinctively low and lactic acid fermentation occurs even during distribution. So, there is a need for the standardization of *kimchi* in order to distinguish it from other fermented vegetables stated above. The product "kimuchi" which is selling in Japan is an expression by Japanese pronunciation of Korean *kimchi*. Also, the term "*kimchi*" is written in other spelling - "kimchee" which is sometimes used in some countries including the United States.

Types of *kimchi* are distinguished by their raw

materials and preparation methods. Though numerous types are known, *kimchi* is usually made of three essential components - vegetables, spices or seasonings and others. Among various types, internationally traded or marketed *kimchi* is mainly of baechu-*kimchi*(baechu means Chinese cabbage or nappa cabbage in Korean) which is usually referred to simply *kimchi*. Hereby, we premise that the term "*kimchi*" used in proposed draft CODEX Standard for *kimchi* means baechu-*kimchi*.

Kimchi is a good source of vitamin C, A, the B groups and dietary fibre. On the other hand, fat content is very low so that *kimchi* is believed to be helpful in preventing chronic disease such as hypertension, arteriosclerosis and colon cancer. And *kimchi* could be an excellent source of lactic acid and lactic acid bacteria which help the consumers' health.

Wholesomeness of *kimchi* is guaranteed by lactic acid fermentation. *Kimchi* fermentation is achieved by lactic acid bacteria from nature. One of the characteristics of *kimchi* production process is that usually there is no heat treatment to destroy the lactic acid bacteria and other microorganisms in *kimchi*. So there is quite a possibility of changes in *kimchi* quality by the growth of lactic acid bacteria during transportation and distribution as mentioned above. By the growth of lactic acid bacteria, uniquely sour and carbonated taste of *kimchi* are formed. Extreme quality changes caused by overgrowth of lactic acid bacteria result in overripe products which are characterized by pungent sourness, flabby texture and even mouldy flavour. By sensory evaluation and chemical analysis it has been revealed that the *kimchi* of which acidity is higher than 1.0% (m/m) as lactic acid is organoleptically objectionable to most consumers. Though overripe *kimchi* is of little value as a commodity,

it is hard to evaluate the quality of *kimchi* in a packaging before serving for consumers.

While producing *kimchi*, much caution is required to remove the objectionable matters in major raw materials, especially Chinese cabbage, by washing and so on. Chinese cabbage harvested from the field may contain larva or earthy matters. Though Chinese cabbage belongs to leafy vegetable, it is hard to wash inner part of it, because of its compact structure similar to that of lettuce. So, by incautious practices *kimchi* may contain objectionable matters and mineral impurities. In fact, some claims have been issued by the presence of larva or hairs in packed *kimchi*.

It is believed that possibility of problems caused by heavy metal contamination and pesticide residue in *kimchi* is negligible by using proper raw materials and by proper washing of raw materials. But, iron could be an exception. Most iron in *kimchi* originates from hackneyed facilities which come in direct contact with *kimchi* during processing can cause a health problem to consumers.

International trade of *kimchi* has been steadily increasing over the last ten years and Korea is now exporting mainly baechu-*kimchi* (Chinese cabbage *kimchi*) to over 35 countries. In addition, Japan and China are known to be exporting *kimchi*. But, most countries have no appropriate or specific commodity standard which can be applied to the inspection of imported *kimchi*. Consequently, the application of inspection criteria for imported *kimchi* varies greatly among countries and is likely to result in international trade disputes.

In spite of some problems mentioned above, to date no attempt has been made to develop a standardization system for the international *kimchi* trade. For these reasons there is an urgent need for the elaboration of an international standard for *kimchi* to facilitate fair trade and to care for consumers' health.

2. Nutritional Value and Organoleptic Characteristics

2.1 Nutritional characteristics

The nutrients of *kimchi* vary with main components. The properly ripe *kimchi* contains much more lactic acid bacteria than commercial yoghurt products and they are

helpful in controlling the intestinal microflora. The composition of typical *kimchi* is shown in Table 1.

Table 1. Chemical composition of typical *kimchi*
(per 100g *kimchi*)

Nutrient	Content	Nutrient	Content
Food energy(kcal)	32.0	Calcium(mg)	45.0
Moisture(g)	88.0	Phosphorus(mg)	28.0
Crude protein(g)	2.2	Vitamin A(IU)	210.0
Crude fat(g)	0.5	Vitamin B ₁ (mg)	0.05
Nitrogen free extract(g)	4.7	Vitamin B ₂ (mg)	0.08
Crude fibre(g)	0.7	Niacin(mg)	0.5
Ash(g)	3.1	Vitamin C(mg)	21.0

Dietary fibre in *kimchi* has an effect of preventing constipation and controlling intestinal flora. Also, fibre-rich foods like *kimchi* which also contain vitamin A and C are believed to lower the risk of colon cancer. *Kimchi* is a good source of vitamin C and A. In particular, the level of vitamin C (21mg per 100g of *kimchi*) is higher than that of many kinds of fruits such as apple, pear and melon, etc. In terms of the mineral content, calcium and phosphorus are the major components in *kimchi*. The fat content is very low, such that *kimchi* can be considered as a low caloric food. Furthermore, the nutritional value is increased by the addition of seafoods such as oysters, anchovy and shrimp which provide protein source.

2.2 Organoleptic characteristics

The overall taste of *kimchi* is characterized by hot, sour, salty, and carbonated taste. The typical odour is combination of sour and uniquely spicy note with green odour in unripe *kimchi* and particular acidic odour in overripe *kimchi*. Unripe *kimchi* is characterized by its saltiness whereas overripe *kimchi* is predominantly sour. The texture of *kimchi* is reasonably firm and crisp with chewy texture that becomes softer as it ripens. The colour of typical *kimchi* is light red due to the addition of red pepper. As the product matures, however, its appearance changes, probably due to the vegetable components becoming more translucent.

The chemical components related to the organoleptic quality of *kimchi* depends on its type, its preparation and

the storage methods. The compounds contributing to *kimchi* quality are derived from the interaction of substrates, enzymes, and microorganisms during preparation and fermentation. The pattern of specific compounds is very complex; however, the principal compounds are organic acids, sugars, salts, and volatile compounds such as dimethyl disulfide, methyl allyl sulfide, diallyl sulfide and diallyl disulfide, etc. The organic acids in *kimchi* are formed mainly by the fermentation of sugars in the raw materials (Table 2) and have an effect on suppressing the growth of harmful bacteria. Lactic and citric acids are the major non-volatile organic acids present in all types of *kimchi* whereas acetic and propionic acids are the major volatile organic acids. The spices, especially red pepper or garlic also contribute to the production of organic acids during fermentation.

By its unique nature, *kimchi* helps to balance the dietary intake of high caloric animal foods.

Table 2. Changes in non-volatile organic acids in *kimchi* during fermentation at 5°C (mg/100g *kimchi*)

Organic acid	Fermentation days			
	19	23	31	40
Lactic acid	16.2	27.5	29.4	30.6
Citric acid	15.7	22.0	13.9	20.4
Malic acid	17.7	13.6	5.6	4.8
Succinic acid	3.2	1.2	1.5	1.7
Malonic acid	0.4	0.3	0.4	0.4
Oxalic acid	0.4	0.3	0.5	0.1
Total	53.6	64.9	51.3	58.0

3. *Kimchi* Manufacturing Processes and Consumption

Appropriate cultivars of Chinese cabbage (*Brassica pekinensis* Rupr.), with little defects, are required for the production of *kimchi*. After removing outer leaves and roots, the Chinese cabbage is cut into appropriate sized pieces/parts and brined in salt solution (8~15%) for 2~10 hours to reduce non-halophilic microorganism and to obtain a proper salt content in the cabbage. It is then rinsed several times with fresh water and drained or centrifuged to remove excess water.

The seasoning mixture is prepared separately. The recipe of the seasoning mixture for *kimchi* varies among

manufacturers but the seasoning mixture is usually composed of powdered red pepper, chopped garlic, chopped ginger, sliced onions or shallot, sliced radish, sugar, and salted(fermented) seafoods.

The seasoning mixture is evenly mixed with the pretreated cabbage as described above, and the product is then packed into suitable containers before or after fermentation. *Kimchi* fermentation can be carried out at a low temperature (from 0°C to room temperature) depending on the manufacturers and the ripening rate desired. Because ripening rate of *kimchi* depends on the temperature, it is recommended that the temperature be kept between -3°C and -4°C during storage and transportation of packed *kimchi* products.

A typical recipe and process for *kimchi* are shown in Table 3 and Fig. 1.

Kimchi is usually consumed as a favorable side dish with cooked rice or noodle. Also, it can be used as an ingredient in preparing other types of foods including *kimchi*-chigae (a kind of vegetable soup prepared from *kimchi*, meat, tofu, etc.), and *kimchi*-bokumbap (a type of fried rice with *kimchi*), and others. Because of its uniquely hot, sour, and salty taste, *kimchi* matches well with various types of foods other than rice. It is taken as vegetable salad when eating red meat. It is also good material for preparing vegetable soup for western meal table. *Kimchi* is well utilized in making western food like pizza, *kimchi* spaghetti, *kimchi* hamburger patty, and so on.

Amount of *kimchi* consumed in Korea in recent years is shown in Fig. 2. In 1992, more than 2 million metric tons of *kimchi* was consumed in Korea alone.

Table 3. Typical recipe for *kimchi*

Components	%
Chinese cabbage	85.6
Powdered red pepper	2.9
Sliced radish	2.8
Salt	2.5
Salted and fermented seafoods	1.8
Sliced onions	1.5
Chopped garlic	1.4
Sugar	0.8
Chopped ginger	0.7
	100.0

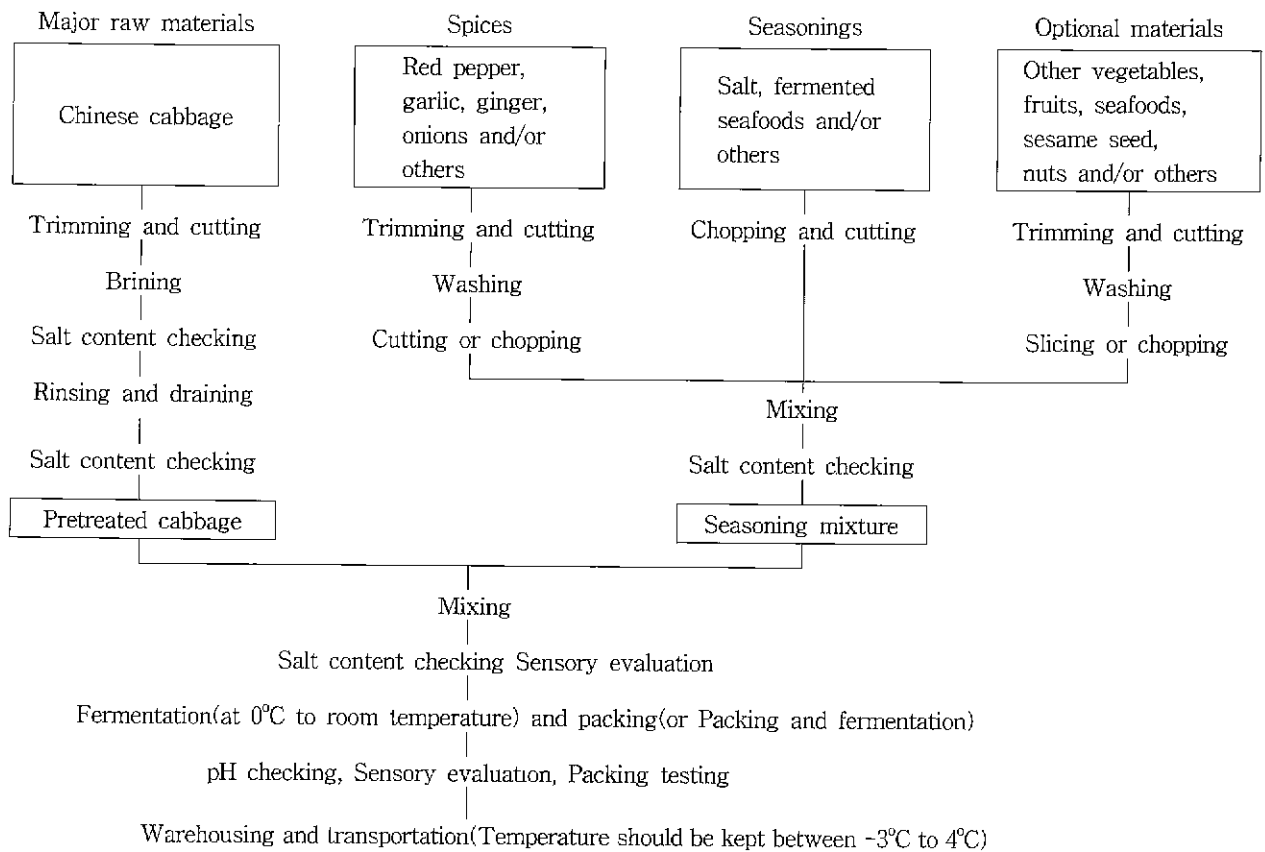


Fig. 1. Typical process flow diagram for *kimchi* production.

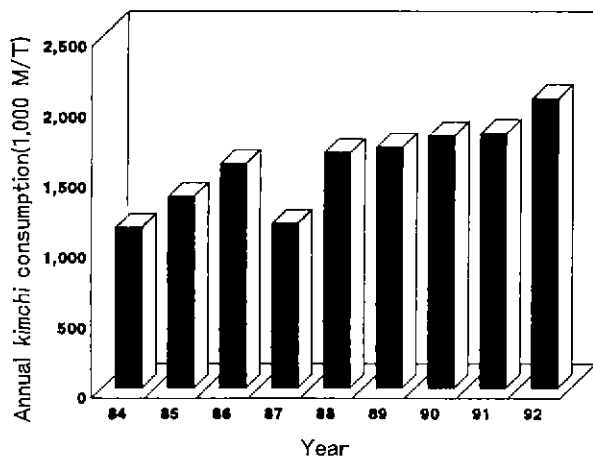


Fig. 2. Annual changes of *kimchi* consumption in Korea during 1984~1994.

4. Packaging and Distribution

4.1 Packaging types

The packaging used for *kimchi* can be generally classified into five major types: glass bottles, plastic bottles, plastic film pouches, plastic trays, and cans.

Most plastic bottles are constructed of polyester (PET). Plastic films are made from materials such as polyethylene (PE), polypropylene (PP), polyester (PET), nylon, and polyvinylidenechloride (PVDC). Multilayer laminates of these materials, aluminum foil, and aluminum metalized films are conventionally used for packaging of *kimchi*. Plastic trays are usually made from PE, PP, polystyrene (PS) and coextruded multilayer materials.

Glass bottles and plastic bottles are the most widely used packaging for the international trade of *kimchi* although tinplate cans are also used. Plastic film pouches and packaging trays are used for short-term storage and distribution.

4.2 Packing methods and pack units

In the packing of *kimchi*, both atmospheric and vacuum packing is commonly used. In recent years, adding a gas-absorbent, vacuum packing or leaving a significant head-space within the container have been used to prevent from the over-expansion of the pack due to the of production

Table 4. Export of *kimchi* from Korea by destination(in value)

(Unit : US \$)

Export to	Year						
	1988	1989	1990	1991	1992	1993	1994
Australia	8,529	18,268				45,592	5,094
Bahrein	78,462	68,885	30,000				
Belgium						17,966	2,462
Canada		78,202	67,045	36,129	20,916	1,889	1,948
France	12,276	30,397	107,349	207,345	91,753	133,411	24,690
Germany	2,416	5,035	8,615	67,315	33,303	25,340	6,944
Guam	167,146	235,027	375,557	299,652	165,771	86,656	38,236
Honduras						20,000	
Hong Kong						99,938	106,146
Indonesia	21,753	44,481	45,092	83,689	8,965	92,247	66,365
Japan	10,151,622	10,542,630	10,364,447	13,888,887	18,922,948	28,739,026	37,726,032
Jordan	29,050						
Kenya						10,170	9,260
Kuwait	286,187	94,492	34,447				
Libya	67,613	85,723	106,611	147,900	162,907	128,562	177,289
Mariana	118,918	220,685	286,549				
Micronesia						48,046	65,797
Netherlands	15,121	8,402	9,002	52,607	153,875	145,192	125,690
New Zealand	5,347	20,598	6,200	78,152	19,914	38,207	12,399
Oman	44,613	10,441	11,633	17,209	48,034		
Palau						1,920	2,016
P. Peru						11,266	95,740
Portugal						54,797	7,533
Russia						90,706	9,028
A. Samoa						13,550	
Saudi Arabia	163,772	78,476					
Singapore	112,198	83,786		66,310	60,221	67,174	141,525
Spain	160,854	277,391	409,068	191,342	120,818	250,694	297,614
Surinam	69,046	41,756	48,270		15,759	16,125	
Swiss						6,277	
Taiwan	24,128	9,821	22,095	57,131	38,798		
U.A.E.	140,749	32,305	110,054	18,144	17,962		
U.K.				39,208		40,974	1,278
Uruguay				150,275	29,110		
U.S.A.	170,733	185,157	255,522	293,694	79,891	202,909	180,734
All others	1,380,532	1,889,881	2,093,505	2,388,735	3,097,647	3,809,492	5,094,749
Total	13,231,065	14,061,839	14,775,967	18,083,722	23,088,592	34,203,994	44,191,020

CO₂ gas and volatile organic acids during transportation. Additionally, in the case of bulk type packaging, *kimchi* is often transported in PE film containers inside and outer metal can. This is to minimize the risk of damage during transportation.

The packing unit varies with the nature of the packaging materials and the destination. Usually, in packs for the international trade, pack units range from approximately 0.05kg to 15kg.

4.3 Handling of *kimchi* product

As mentioned above, *kimchi* fermentation is continued even during transportation and selling which causes some problems. In packed *kimchi*, continuous fermentation causes expansion and even rupture of the pack by excessive production of both CO₂ and volatiles under unsuitable conditions during storage and distribution.

And quality changes such as over-ripening and texture-softening are accelerated by undesirable handling

Table 5. Export of *kimchi* from Korea by destination(in quantity)

(Unit : kg)

Export to	Year						
	1988	1989	1990	1991	1992	1993	1994
Australia	4,908	6,981				17,081	526
Bahrein	76,568	59,484	30,000				
Belgium						19,499	816
Canada		40,599	67,045	24,577	8,257	620	256
France	6,936	14,525	107,349	93,499	51,929	64,414	8,121
Germany	1,411	995	8,615	26,907	15,970	10,871	1,724
Guam	121,936	141,379	207,837	163,152	90,159	39,597	16,701
Hong Kong						26,578	34,466
Honduras						5,745	
Indonesia	14,193	25,135	45,092	34,520	2,804	31,798	23,550
Japan	3,682,111	3,513,710	3,384,682	4,203,534	5,116,081	6,992,909	8,723,371
Jordan	25,875						
Kenya						3,108	3,375
Kuwait	278,940	76,350	25,650				
Libya	64,006	73,203	106,611	116,439	88,060	81,993	126,586
Mariana	114,008	183,875	219,312				
Micronesia						15,368	19,217
Netherlands	10,874	3,075	9,002	26,079	63,058	57,190	48,209
New Zealand	5,347	9,886	6,200	44,834	10,015	15,387	6,443
Oman	35,730	9,450	11,633	14,250	30,000		
Palau						652	500
P. Peru						7,661	36,840
Portugal						20,164	2,732
Russia						61,790	692
A. Samoa						2,500	
Saudi Arabia	158,040	70,776					
Singapore	84,875	47,920	38,085	27,588	28,470	22,855	51,476
Spain	139,681	209,399	276,491	122,906	74,745	118,422	100,781
Surinam	49,830	27,630	48,270		9,150	8,025	
Swiss						2,449	
Taiwan	26,719	7,920	22,095	25,405	14,400		
U.A.E.	138,215	28,500	79,309	15,000	6,098		
U.K.				13,237		15,225	360
Uruguay				64,008	12,702		
U.S.A.	90,878	98,620	143,775	145,277	32,882	86,354	63,342
All others	993,075	1,052,385	1,011,959	1,019,932	1,537,682	1,592,533	1,819,931
Total	6,124,156	5,702,797	5,849,012	6,181,144	7,192,462	9,313,787	11,090,015

including storage at higher temperature.

Therefore, a cold chain system is required for the distribution of *kimchi* to minimize these problems by offering low storage temperatures below 10°C.

5. International Trade of *Kimchi*

Kimchi is an internationally traded food product which shows consistently increasing market size. More than

35 countries including Japan, U.S.A., Spain, France, Germany, Indonesia, and Taiwan have been importing *kimchi*. Korea shares most of the international *kimchi* export, while Japan is a major importer from Korea. Total *kimchi* export from Korea alone amounted to more than 44 million U.S. dollars in 1994 (Table 4). This equated to over 11 thousand metric tons and represented a 52 percent increase in volume of trade over the period of 1988 to 1994 (Table 5). Korean export to Japan alone

Table 6. Export of "Other vegetables and mixtures of vegetables, prepared or preserved, not frozen" by Japan
(Unit : US \$)

Export to	Year				
	1988	1989	1990	1991	1992
Hong Kong	509,808	754,908	1,029,420	1,303,932	1,637,268
Singapore	372,552	558,828	666,672	705,888	931,380
Taiwan	1,401,972	1,833,348	2,264,724	1,794,132	1,892,172
U.S.A.	8,303,988	8,941,248	9,411,840	9,813,804	9,372,624
All others	2,568,648	2,892,180	3,362,772	3,617,667	3,715,716
Total	13,156,968	14,980,512	16,735,428	17,235,423	17,549,160

increased by 137 percent from 3,682 tons to 8,723 tons during the period of 1988~94.

Japanese export of *kimchi* cannot be precisely analyzed as Japan does not classify *kimchi* as a single item in the trade statistics report. Rather, *kimchi* is classified as "Other vegetables and mixtures of vegetables, prepared or preserved, not frozen". However, as *kimchi* is one of the most important items in this food group, a rough estimate of Japanese *kimchi* export may be drawn from the statistics on this food group. Japanese export of this group recorded 17.5 million U.S. dollars in 1992 (Table 6).

6. Finished Product Specification

Kimchi

- Total acidity (as lactic acid) Max. level 1.5% m/m
- Salt content 1.5~4.5%
- Mineral impurities Max. level 0.08% m/m
- Drained weight Min. level 80% m/m
- Colour Characteristic colour of the designated product
- Texture Reasonable crisp but not softer
- Odour and taste Characteristic of the designated product and free from foreign and moldy odour and taste

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별 첨 2.

- Codex 사무국에 제안된 김치 규격안(한국발의)

PROPOSED DRAFT CODEX STANDARD FOR *KIMCHI*

1. SCOPE

This standard covers the product known as Chinese cabbage *kimchi*(in some countries, *baechu kimchi*) among the various types of *kimchi* which is prepared with seasoned and fermented various kinds of vegetables which have been trimmed, cut, salted and seasoned before fermentation.

The word "*kimchi*", hereafter used in this document means "Chinese cabbage *kimchi*" or "*baechu kimchi*".

2. DESCRIPTION

2.1 Products definition

(a) "*Kimchi*" shall be the product of which the predominant ingredients are Chinese cabbages belonging to *Brassica pekinensis* Rupr. and other ingredients for seasoning.

(b) Chinese cabbage free from little defects is trimmed to remove inedible parts, cut into suitable sized pieces/parts, salted, washed with fresh water, and drained to remove extra water ; and

(c) Mixed with seasoning mixture which is mainly composed of red pepper powder, chopped garlic, chopped ginger, sliced onions, and sliced radish, etc.

(d) Fermentation of this mixture can be carried out before or after packing into appropriate containers to ensure the proper ripening and preservation of the product by lactic acid production at low temperatures.

2.2 Styles

The product shall be presented in one of the following style :

(a) Whole-whole Chinese cabbage

(b) Halves-Chinese cabbages divided lengthwise into halves

(c) Quarters-Chinese cabbages divided lengthwise into quarters

(d) Slices or chips-Chinese cabbage leaves cut into pieces of 1~6cm in length and width

3. ESSENTIAL COMPOSITION AND QUALITY FACTORS

3.1 Basic ingredients

Chinese cabbage, red pepper, garlic, ginger, and salt

3.2 Optional ingredients

Fruits, nuts, sesame seeds, sugar, salted and fermented seafoods, glutinous rice paste, wheat flour paste, and other vegetables

3.3. Quality criteria

3.3.1 Minimum quality requirement

Kimchi shall be prepared from such materials and using such practices that the finished products shall comply with the following requirements :

(a) Total acidity(as lactic acid)-not more than 1.0% m/m

(b) Salt content-1.5~4.0% m/m

(c) Mineral impurities-not more than 0.03% m/m

3.3.2 Colour

The colour of product shall be light red to deep red.

3.3.3 Taste

The product shall have hot, salty, and slightly sour taste.

3.3.4 Texture

The product shall be reasonably firm, crisp, and chewy.

4. FOOD ADDITIVES

	Maximum Level
4.1 Colours	
β-Carotene	} 300mg/kg singly or in combination
Riboflavin	
Paprika oleoresin	
4.2. Firming agents	
Calcium lactate	} 300mg/kg singly or in combination
Calcium gluconate	
4.3. Flavours	
Natural flavours and natural-identical flavours, as defined in the Codex Alimentarius Volumn I(2nd ed., 1994)	} Limited by GMP
4.4 Flavour Enhancers	
Disodium 5'-guanylate	} Limited by GMP
Disodium 5'-inosinate	
Monosodium L-glutamate	

5. CONTAMINANTS

Iron(Fe)	10.0mg/kg
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6. HYGIENE

It is recommended that the product covered by the provisions of this standard be prepared and handled in accordance with the appropriate sections of the Recommended International Code of Practice-General Principles of Food Hygiene(CAC/RCP 1-1969, Rev. 2-1985), and other Codes of Practice recommended by the Codex Alimentarius Commission which are relevant to this product.

6.1 As far as is possible when produced in accordance with good manufacturing practice, the product shall be free from objectionable matter.

6.2 When tested by appropriate methods of sampling and examination, the product :

–shall be free from microorganisms in amount which may represent a hazard to health

– shall be free from mammalian parasites which may represent a hazard to health ; and

– shall not contain any substances originating from microorganisms at levels which may represent a hazard to health.

7. LABELLING

The products shall be labelled in accordance with the codex standard for the labelling of Prepacked Foods (Ref. No. CODEX STAN 1-1985, Rev. 1-1991) Codex Alimentarius Vol. 1 ; the following specific provisions apply :

7.1 Name of the food

7.1.1 The name of the product shall be "kimchi"

7.1.2 The style shall be included in close proximity to the name of the product

8. WEIGHTS AND MEASURES

8.1 Fill of container

8.1.1 Minimum Drained Weight

The drained weight of the product, as a percent by weight of the water capacity of the container shall be not less than 80%.

9. METHODS OF SAMPLING AND ANALYSIS

9.1 General requirements of sampling

9.1.1 Samples shall be taken and stored in a protected cool place-from 0°C to 4°C such that there is no deterioration of the material.

9.1.2 Precautions shall be taken to protect the sample, the material being sampled, the sampling instruments, and the sampled containers from adventitious contamination.

9.1.3 The sample shall be placed in clean and dry glass containers with air tight stoppers or closures. It shall be marked with full details of sampling, date of sampling, name of the vendor and other particulars of the consignment.

9.2 Scale of sampling

Sampling shall be in accordance with the FAO/WHO Codex Alimentarius Sampling Plans for Prepackaged Foods(AQL-6.5) (Ref. No. CAC/RM 42-1969).

9.3 Determination of total acidity

Total acidity shall be determined by titration with a standard NaOH solution using the glass electrode method. Reference : Official Methods of Analysis of the Association of Official Analytical Chemists, 16th Edition, Section 37.1.37B. Results shall be reported as percent by weight expressed as lactic acid.

9.4 Determination of salt content

Sodium chloride shall be determined by titration with a standard silver nitrate solution. Reference : Official Methods of Analysis of the Association of Official Analytical Chemists, 14th Edition, Section 321.034-32.039. Results shall be expressed as percent by weight.

9.5 Determination of mineral impurities

Mineral impurities shall be determined according to the FAO/WHO Codex Alimentarius Methods of Analysis for Processed Fruits and Vegetables(Ref. No. CAC/RM 49-1972), Determination of Mineral Impurities(sand), except that Step 4.13, 4.14 and 4.15 relating to treatment with hydrochloric acid are omitted. Results shall be expressed as percent by weight.

9.6 Determination of drained weight

Drained weight shall be determined according to the FAO/WHO Codex Alimentarius Methods of Analysis for Processed Fruits and Vegetables(Ref. No. CAC/RM 36-1970). Determination of Drained Weight-Method I. Results shall be expressed as percent by weight calculated on the basis of the mass of distilled water at 20°C which the sealed container will hold when completely filled.