

Studies on Flavor Enhancer Products Used in Korean Households in the Incheon Area

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ABSTRACT

This survey was carried out using a self-administered questionnaire in order to investigate the flavor enhancer products used by Korean housewives in Incheon. The subjects were 600 housewives living in Incheon. For statistical analysis, 503 well-completed questionnaires were used out of 505 collected (collection rate: 84.2%). Most housewives used flavor enhancer products. Housewives with higher educations and employed housewives used significantly less flavor enhancer. The main reason for nonuse of flavor enhancer products was their perceived negative health effects. Housewives mainly used flavor enhancer products in stews and whole dishes. Most housewives used flavor enhancer products 1–2 times per day and housewives with higher educations and employed housewives used flavor enhancer products less frequently. As for the quantity of flavor enhancer products used, most housewives reported small to moderate amounts. Housewives with higher educations used significantly smaller amounts of flavor enhancer products. There was a significant difference in the kinds of flavor enhancer products used by housewives, depending on education level, household income, food expenditures and residence type. Most housewives purchased flavor enhancer products at wholesale marts. There was a significant difference in the places where flavor enhancer products were purchased among those of different education and household income levels. Therefore, these results may be useful in the development of safer and more variously flavored flavor enhancer products.

KEY WORDS: flavor enhancer products, monosodium glutamate, 5'-nucleotides, complex flavor enhancer.

INTRODUCTION

Flavor enhancer products can be divided into three main categories: Monosodium glutamate (MSG), 5'-ribonucleotides and complex flavor enhancer.¹⁾ MSG and 5'-ribonucleotides products are manufactured by microbial fermentation using starch, sugar beets, sugar cane, etc.²⁻⁴⁾ and complex flavor enhancer products are mixtures of natural materials with salt, spices, MSG and 5'-ribonucleotides, etc.¹⁾

In East Asia, MSG has been used in the form of seaweed broth⁵⁾ and is now used worldwide as a flavor enhancer product in a variety of foods prepared at home, in restaurants and at food processing plants.^{6,7)} MSG is a fine, white crystal substance that has a unique taste described as "umami" (delicious or savory).^{2,4,8)}

5'-ribonucleotides such as inosine-5-monophosphate (IMP) and guanosine-5-monophosphate (GMP) were found to

occur naturally in meat and mushrooms.^{9,10)} It has been reported that the intensity of the umami taste is markedly enhanced when 5'-ribonucleotides are mixed with MSG.^{2,8,11)}

Since complex flavor enhancer was first developed in 1975, its convenience has caused marked increases in use, especially in East Asia, which includes Korea and Japan.¹⁾ A variety of complex flavor enhancers recently appeared: powder-type, visualized particle-type, liquid-type, a type with a high portion of natural materials such as freeze-dried beef powder and instant-type, etc.¹²⁾

As in previous studies,^{13,14)} housewives' perception of flavor enhancer products is reported here in terms of taste, convenience, affordability, safety, considerations in purchasing products and consumer requirements,¹³⁾ and the housewives' perceptions of MSG symptom complex when eating out.¹⁴⁾

The purpose of this study was to investigate the flavor enhancer products used by Korean housewives in Incheon and provide information for the development of safe, tasty and many-flavored enhancer products aimed at housewives of different tastes and socioeconomic levels.

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SUBJECTS AND METHODS

1. Subjects and period

This survey was carried out using a self-administered questionnaire from August 1 to 31, 1999. The subjects were 600 housewives living in Incheon. For statistical analysis, 503 well-completed questionnaires were used from among 505 collected (collection rate: 84.2%).

2. Questionnaire

The original questionnaire was pre-tested and modified according to the results of a pilot study. The questionnaire sought socioeconomic data such as age, education level, household income, food expenditures, residence type and use of flavor enhancer products (including reasons for nonuse, kinds of products used, kinds of dishes in which enhancers were used, frequency of use, amount used and place of purchase).

3. Statistical analysis

The statistical analysis was conducted using SAS Program. Frequency counts (%), mean and standard deviation were calculated for all variables and the Chi-square test

was used to determine statistical significance.

RESULTS AND DISCUSSION

1. General characteristics of subjects

General characteristics of subjects with respect to perception of flavor enhancer products¹³ and housewives perceptions of their own MSG symptom complex in eating out¹⁴ was shown in previous studies.^{13,14} It was found that 17.1% of subjects were younger than 35 years of age, 31% were 35–39, 31.2% were 40–44 and 20.7% were 45 years of age or older. As for education level, 59% of subjects graduated from high school, 30.6% received a college education or better and 10.4% reached only the middle school level or lower. As for occupation, full-time housewives accounted for 66.7% of participants and employed housewives 33.3%. Monthly household income was as follows: less than 1 million won 11.1%, 1–1.49 million won 24.3%, 1.50–1.99 million won 30.3%, and 2 million won or more 34.3%. As for monthly food expenditures, 30.2% of subjects paid monthly amounts of 300,000–399,000 won, 26.0% 500,000 won or more, 20.7% 400,000–499,000 won and 23.1% less than 300,000 won. Also, 71.0% of subjects were apartment-dwellers, 15.8%

Table 1. Household use of flavor enhancer products

Variables	Group	Use	Nonuse	Total	P value	N (%)
Age (years)	Younger than 35	77 (89.5)	9 (10.5)	86 (17.1)	$\chi^2 = 4.903^{NS}$ df = 3 p = 0.179	
	35–39	133 (85.3)	23 (14.7)	156 (31.0)		
	40–44	146 (93.0)	11 (7.0)	157 (31.2)		
	45 or older	93 (89.4)	11 (10.6)	104 (20.7)		
	Total	449 (89.3)	54 (10.7)	503 (100.0)		
Education level	Middle school or lower	48 (94.1)	3 (5.9)	51 (10.4)	$\chi^2 = 18.949^{**}$ df = 2 p = 0.001	
	High school	269 (93.1)	20 (6.9)	289 (59.0)		
	College or higher	120 (80.0)	30 (20.0)	150 (30.6)		
	Total	437 (89.2)	53 (10.8)	490 (100.0)		
Occupation	Employed housewife	139 (84.2)	26 (15.8)	165 (33.3)	$\chi^2 = 6.665^*$ df = 1 p = 0.010	
	Full-time housewife	304 (91.8)	27 (8.2)	331 (66.7)		
	Total	443 (89.3)	53 (10.7)	496 (100.0)		
Household income (10,000won/month)	Less than 100	52 (94.6)	3 (5.5)	55 (11.1)	$\chi^2 = 7.841^*$ df = 3 p = 0.049	
	100–149	110 (91.7)	10 (8.3)	120 (24.3)		
	150–199	137 (91.3)	13 (8.7)	150 (30.4)		
	200 or more	142 (84.0)	27 (16.0)	169 (34.2)		
	Total	441 (89.3)	53 (10.7)	494 (100.0)		
Food expense (10,000won/month)	Less than 30	103 (90.4)	11 (9.7)	114 (23.1)	$\chi^2 = 9.332^*$ df = 3 p = 0.025	
	30–39	141 (94.6)	8 (5.4)	149 (30.2)		
	40–49	89 (87.3)	13 (12.8)	102 (20.7)		
	50 or more	107 (83.6)	21 (16.4)	128 (26.0)		
	Total	440 (89.3)	53 (10.8)	493 (100.0)		
Residence type	Singlefamily house	75 (94.9)	4 (5.1)	79 (15.8)	$\chi^2 = 4.708^{NS}$ df = 2 p = 0.095	
	Apartment	310 (87.3)	45 (12.7)	355 (71.0)		
	Multistorey house	61 (92.4)	5 (7.6)	66 (13.2)		
	Total	446 (89.2)	54 (10.8)	500 (100.0)		

NS: not significant, *: p < 0.05, **: p < 0.01

lived in single-family housing and 13.2% in multi-story housing.

2. Use of flavor enhancer products

1) Use of flavor enhancer products

Table 1 shows that most housewives used flavor enhancer products (89.2% or more), which is similar to the results of previous studies regarding housewives' use of chemical flavor enhancer products such as MSG and 5'-ribonucleotides in Seoul and the Kyonggi area.¹⁵⁾

There were no significant differences in the use of flavor enhancer products among groups divided by age and residence type. However, housewives who had higher educations used significantly less flavor-enhancer ($p = 0.001$). As for occupation, employed housewives used significantly less flavor enhancer ($p = 0.01$). Housewives in families with higher household incomes used significantly less flavor enhancer ($p = 0.049$) and housewives who reported higher food expenditures also used significantly less flavor enhancer ($p = 0.025$). Housewives living in apartments used less flavor enhancer compared to those living in houses, but the difference was not significant ($p = 0.095$). These results might mean that housewives in lower-income fam-

ilies or those who spend less on food use more flavor enhancer instead of buying expensive and flavorful foods. In a previous study,¹³⁾ there was a significant difference in perceptions about the affordability of flavor enhancer products among groups divided by household income and food expenditures.

2) Reason for nonuse of flavor enhancer products

The main reasons cited for nonuse of flavor enhancer products were harmfulness to health (52% or more) or not necessary (40% or more) (Table 2). In the previous studies,^{13,14)} the main reasons cited for use of chemical enhancer products was taste and convenience in that order and the main reasons cited for nonuse were harmfulness to health and dislike of certain flavors in that order. There was no significant difference in reasons for nonuse among groups divided by age, education level, occupation, household income, food expenditures and residence type, which might be due to a smaller number of non-users compared to users of flavor enhancer products. In the previous study,¹³⁾ 48.1% of housewives perceived that flavor enhancer products were detrimental to health. The highest percentage was recorded among those with higher educations.

Table 2. Reason for nonuse of flavor enhancer products in households

Variables	Group	Harmful to health	Not necessary	Other	Total	N (%)	P value
Age (years)	Younger than 35	3 (42.9)	3 (42.9)	1 (14.3)	7 (13.7)	$\chi^2 = 3.245^{NS}$ df = 6 $p = 0.778$	
	35 - 39	12 (54.6)	9 (40.9)	1 (4.6)	22 (43.1)		
	40 - 44	5 (45.5)	6 (54.6)	-	11 (21.6)		
	45 or older	7 (63.6)	3 (27.3)	1 (9.1)	11 (21.6)		
	Total	27 (52.9)	21 (41.2)	3 (5.9)	51 (100.0)		
Education level	Middle school or lower	1 (33.3)	1 (33.3)	1 (33.3)	3 (6.0)	$\chi^2 = 8.306^{NS}$ df = 4 $p = 0.081$	
	High school	7 (41.2)	10 (58.8)	-	17 (34.0)		
	College or higher	19 (63.3)	9 (30.0)	2 (6.7)	30 (60.0)		
	Total	27 (54.0)	20 (40.0)	3 (6.0)	50 (100.0)		
Occupation	Employed housewife	15 (60.0)	9 (36.0)	3 (4.0)	25 (50.0)	$\chi^2 = 0.867^{NS}$ df = 2 $p = 0.648$	
	Full-time housewife	12 (48.0)	11 (44.0)	2 (8.0)	25 (50.0)		
	Total	27 (54.0)	20 (40.0)	3 (6.0)	50 (100.0)		
Household income (10,000won/month)	Less than 100	1 (33.3)	2 (66.7)	-	3 (6.0)	$\chi^2 = 7.630^{NS}$ df = 6 $p = 0.266$	
	100 - 149	5 (50.0)	3 (30.0)	2 (20.0)	10 (20.0)		
	150 - 199	4 (36.4)	6 (54.6)	1 (9.1)	11 (22.0)		
	200 or more	16 (61.5)	10 (38.5)	-	26 (52.0)		
	Total	26 (52.0)	21 (42.0)	3 (6.0)	50 (100.0)		
Food expense (10,000won/month)	Less than 30	3 (33.3)	5 (55.6)	1 (11.1)	9 (18.0)	$\chi^2 = 6.877^{NS}$ df = 6 $p = 0.332$	
	30 - 39	2 (25.0)	5 (62.5)	1 (12.5)	8 (16.0)		
	40 - 49	9 (75.0)	3 (25.0)	-	12 (24.0)		
	50 or more	12 (57.1)	8 (38.1)	1 (4.8)	21 (42.0)		
	Total	26 (52.0)	21 (42.0)	3 (6.0)	50 (100.0)		
Residence type	Singlefamily house	3 (75.0)	1 (25.0)	-	4 (7.8)	$\chi^2 = 1.861^{NS}$ df = 4 $p = 0.761$	
	Apartment	22 (52.4)	17 (40.0)	3 (7.1)	42 (82.4)		
	Multistory house	2 (40.0)	3 (60.0)	-	5 (9.8)		
	Total	27 (52.9)	21 (41.2)	3 (5.9)	51 (100.0)		

NS: not significant

3) Kinds of dishes in which flavor enhancer products mainly used

Table 3 shows the main kinds of dishes in which Incheon housewives used flavor enhancer products. The highest figures were recorded for stews (42.9% or more) and whole dishes (41.2% or more). In a previous study¹⁵⁾ conducted in Seoul and the Kyonggi area, housewives mainly used chemical flavor enhancer products in stews, soups and kimchi. There was no significant difference in the kinds of dishes in which flavor enhancer products were used by housewives in groups divided by age, education level, occupation, household income, food expenditures and residence type.

4) Frequency of use of flavor enhancer products

Most housewives used flavor enhancer products 1–2 times per day (78.2% or more). Roughly 9.8% used them 3–4 times per day while 2.0% or more used them 5–6 times or more per day. There was no significant difference in the frequency of use of flavor enhancer products among groups divided by age, household income, food expenditures and residence type. However, housewives with higher educations ($p = 0.001$) and employed housewives ($p = 0.018$) used flavor enhancer products less frequently (Table 4).

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5) Self-recognized use of flavor enhancer products

Table 5 shows housewives' perceptions of their own use of flavor enhancer products broken down into categories of small amounts (67.2% or more), moderate amounts (30.6% or more) and large amounts (1.5%). In the previous study¹⁵⁾ conducted in Seoul and the Kyonggi area, the percentage of housewives that reported using small amounts of chemical flavor enhancer products was 76.28%. The figure for large amounts was 7.34% and that for moderate amounts, or amounts similar to that for natural materials, was 6.77%. There was no significant difference in perceived amounts of flavor enhancer products used among groups divided by age, occupation, household income, food expenditures and residence type. However, the older the participant ($p = 0.089$) and the higher the education level ($p = 0.003$), the lower the perceived level of flavor enhancer product use.

6) Kinds of flavor enhancer products used by housewives

Table 6 shows that younger housewives used significantly more complex power-type flavor enhancer products

Table 3. Household dishes of mainly using flavor enhancer products

N (%)

Variables	Group	Stew	Salad	Sauting	Kimchi	Whole dishes	Total	P value
Age (years)	Younger than 35	33(45.8)	2 (2.8)	1 (1.4)	4 (5.6)	32 (44.4)	72 (16.4)	$\chi^2 = 10.921^{NS}$
	35 – 39	52 (38.8)	8 (6.0)	1 (0.8)	7 (5.2)	66 (49.3)	134 (30.3)	df = 12
	40 – 44	63 (44.1)	9 (6.3)	–	7 (4.9)	64 (44.8)	143 (32.7)	$p = 0.536$
	45 or older	42 (47.2)	7 (7.9)	2 (2.3)	8 (9.0)	30 (33.7)	89 (20.3)	
	Total	190 (43.4)	26 (5.9)	4 (0.9)	26 (5.9)	192 (43.8)	438 (100.0)	
Education level	Middle school or lower	21 (42.0)	3 (6.0)	–	4 (8.0)	22 (44.0)	50 (11.7)	$\chi^2 = 9.955^{NS}$
	High school	109 (42.3)	17 (6.6)	1 (0.4)	11 (4.3)	120 (46.5)	258 (60.4)	df = 8
	College or higher	53 (44.5)	5 (4.2)	3 (2.5)	11 (9.2)	47 (39.5)	119 (27.9)	$p = 0.268$
	Total	183 (42.9)	25 (5.9)	4 (0.9)	26 (6.1)	189 (44.3)	427 (100.0)	
Occupation	Employed housewife	70 (50.0)	5 (3.6)	1 (0.7)	6 (4.3)	58 (41.4)	140 (32.4)	$\chi^2 = 5.183^{NS}$
	Full-time housewife	117 (40.1)	20 (6.9)	3 (1.0)	19 (6.5)	133 (45.6)	292 (67.6)	df = 4
	Total	187 (43.3)	25 (5.8)	4 (0.9)	25 (5.8)	191 (44.2)	432 (100.0)	$p = 0.269$
Household income (10,000won/month)	Less than 100	24 (50.0)	5 (10.4)	–	–	19 (39.6)	48 (11.1)	$\chi^2 = 10.645^{NS}$
	100 – 149	41 (40.2)	6 (5.9)	1 (1.0)	7 (6.9)	47 (46.1)	102 (23.7)	df = 12
	150 – 199	65 (46.8)	8 (5.8)	1 (0.7)	6 (4.3)	59 (42.5)	139 (32.3)	$p = 0.560$
	200 or more	56 (39.4)	6 (4.2)	2 (1.4)	12 (8.5)	66 (46.5)	142 (33.0)	
	Total	186 (43.2)	25 (5.8)	4 (0.9)	25 (5.8)	191 (44.3)	431 (100.0)	
Food expense (10,000won/month)	Less than 30	44 (43.6)	11 (10.9)	1 (1.0)	5 (5.0)	40 (39.6)	105 (23.5)	$\chi^2 = 13.467$
	30 – 39	55 (40.2)	5 (3.7)	3 (2.2)	8 (5.8)	66 (48.2)	137 (31.9)	df = 12
	40 – 49	37 (44.1)	4 (4.8)	–	7 (8.3)	36 (42.9)	84 (19.5)	$p = 0.336$
	50 or more	50 (46.3)	4 (3.7)	–	6 (5.6)	48 (44.4)	108 (25.1)	
	Total	186 (43.3)	24 (5.6)	4 (0.9)	26 (6.1)	190 (41.2)	430 (100.0)	
Residence type	Singlefamily house	30 (42.3)	2 (2.8)	–	5 (7.0)	34 (47.9)	71 (16.3)	$\chi^2 = 4.072^{NS}$
	Apartment	137 (44.6)	21 (6.8)	3 (1.0)	18 (5.9)	128 (41.7)	307 (70.4)	df = 8
	Multistory house	23 (39.7)	3 (5.2)	1 (1.7)	3 (5.2)	28 (48.3)	58 (13.3)	$p = 0.851$
	Total	190 (43.6)	26 (6.0)	4 (0.9)	26 (6.0)	190 (43.6)	436 (100.0)	

NS: not significant

Table 4. Daily frequency of using flavor enhancer products in households

Variables	Group	None	1-2 times	3-4 times	5-6 times or more	Total	P value
Age (years)	Younger than 35	6 (7.1)	71 (83.5)	8 (9.4)	-	85 (17.2)	$\chi^2 = 7.776^{NS}$ df = 9 p = 0.557
	35-39	18 (11.6)	113 (72.9)	19 (12.3)	5 (3.2)	155 (31.3)	
	40-44	13 (8.3)	123 (78.9)	16 (10.3)	4 (2.6)	156 (31.5)	
	45 or older	10 (10.1)	81 (81.8)	7 (7.1)	1 (1.0)	99 (20.0)	
	Total	47 (9.5)	388 (78.4)	50 (10.1)	10 (2.0)	495 (100.0)	
Education level	Middle school or lower	1 (2.0)	44 (89.8)	4 (8.1)	-	49 (10.1)	$\chi^2 = 25.342^{**}$ df = 6 p = 0.001
	High school	17 (5.9)	236 (81.9)	30 (10.4)	5 (1.7)	288 (59.8)	
	College or higher	28 (19.3)	101 (69.7)	13 (9.0)	3 (2.1)	145 (30.1)	
	Total	46 (9.5)	381 (79.1)	47 (9.8)	8 (1.7)	482 (100.0)	
Occupation	Employed housewife	25 (15.3)	119 (73.0)	16 (9.8)	3 (1.8)	163 (33.4)	$\chi^2 = 10.038^*$ df = 3 p = 0.018
	Full-time housewife	21 (6.5)	263 (80.9)	34 (10.5)	7 (2.2)	325 (66.6)	
	Total	46 (9.4)	382 (78.3)	50 (10.3)	10 (2.1)	488 (100.0)	
Household income (10,000won/month)	Less than 100	2 (3.7)	48 (88.9)	4 (7.4)	-	54 (11.1)	$\chi^2 = 9.483^{NS}$ df = 9 p = 0.394
	100-149	10 (8.6)	91 (77.8)	13 (11.1)	3 (2.6)	117 (24.1)	
	150-199	11 (7.4)	120 (80.5)	15 (10.1)	3 (2.0)	149 (30.7)	
	200 or more	23 (13.9)	121 (72.9)	18 (10.8)	4 (2.4)	166 (34.2)	
	Total	46 (9.5)	380 (78.2)	50 (10.3)	10 (2.1)	486 (100.0)	
Food expense (10,000won/month)	Less than 30	7 (6.3)	96 (85.7)	7 (6.3)	2 (1.8)	112 (23.0)	$\chi^2 = 11.534^{NS}$ df = 9 p = 0.241
	30-39	9 (6.1)	116 (78.4)	20 (13.5)	3 (2.0)	148 (30.4)	
	40-49	12 (11.8)	77 (75.5)	11 (10.8)	2 (2.0)	102 (20.9)	
	50 or more	18 (14.4)	92 (73.6)	12 (9.6)	3 (2.4)	125 (25.7)	
	Total	46 (9.5)	381 (78.2)	50 (10.3)	10 (2.1)	487 (100.0)	
Residence type	Singlefamily house	5 (6.5)	57 (74.0)	13 (16.9)	2 (2.6)	77 (15.7)	$\chi^2 = 7.052^{NS}$ df = 6 p = 0.316
	Apartment	35 (10.0)	278 (79.2)	30 (8.6)	8 (2.3)	351 (71.3)	
	Multistorey house	7 (10.9)	50 (78.1)	7 (10.9)	-	64 (13.0)	
	Total	47 (9.6)	385 (78.3)	50 (10.2)	10 (2.0)	492 (100.0)	

NS: not significant, *: $p < 0.05$, **: $p < 0.01$

than older housewives and that older housewives used more MSG and 5'-ribonucleotide products compared to younger housewives ($p = 0.007$). There were significant differences in the kinds of flavor enhancer products used by housewives among groups divided by education level ($p = 0.001$), household income ($p = 0.008$), food expenditures ($p = 0.033$) and residence type ($p = 0.001$). As for education level, housewives with middle school educations or lower used significantly more MSG and 5'-ribonucleotide products such as GMP and IMP compared to housewives that had college-level educations or better. The latter group used significantly more complex liquid-type flavor enhancer products. Housewives in families with monthly household incomes of less than one million won used significantly more MSG and 5'-ribonucleotide products, the prices of which are lower than those of complex enhancer products, compared to those in higher-income families. Housewives in families with monthly household incomes of two million won or more used significantly more complex liquid-type flavor enhancer products compared to those in lower-income families. Housewives that spent 500,000 won or more on food used significantly more complex liquid-type flavor enhancer products,

the prices of which are higher, compared to those that spent less on food. As for residence type, housewives living in apartments used significantly higher amounts of both complex powder-type and liquid-type flavor enhancer products, the prices of which are higher, compared to those living in single-family or multistorey houses. Compared to the previous results,¹⁵⁾ there was an increase in the use of MSG and 5'-ribonucleotide products and a decrease in the use of complex powder-type products.

7) Places where flavor enhancer products purchased

In terms of the place where flavor enhancer products were purchased, housewives answered wholesale marts (72.6% or more), near retail stores (19.3% or more), department stores (6.5% or more) and markets (0.8% or more) (Table 7). There were significant differences in the places of purchase among groups divided by education level ($p = 0.004$) and household income ($p = 0.027$). Housewives with higher household incomes tended to purchase flavor enhancer products at wholesale marts and those with lower household incomes tended to purchase them at retail stores. There was no significant difference

Table 5. Self-recognized using amount of flavor enhancer products in households

Variables	Group	Moderate	Large	Small	Total	P value	N (%)
Age (years)	Younger than 35	28 (33.7)	3 (3.6)	52 (62.7)	83 (17.4)	$\chi^2 = 10.976^{NS}$ df = 6 p = 0.089	
	35 - 39	54 (37.8)	2 (1.4)	87 (60.8)	143 (30.0)		
	40 - 44	43 (27.7)	1 (0.7)	111 (71.6)	155 (32.5)		
	45 or older	22 (22.9)	1 (1.0)	73 (76.0)	96 (20.1)		
	Total	147 (30.8)	7 (1.5)	323 (67.7)	477 (100.0)		
Education level	Middle school or lower	21 (42.9)	-	28 (57.1)	49 (10.6)	$\chi^2 = 16.346^{**}$ df = 4 p = 0.003	
	High school	98 (35.1)	3 (1.1)	178 (63.8)	279 (60.1)		
	College or higher	26 (19.1)	4 (2.9)	106 (77.9)	136 (29.3)		
	Total	145 (31.3)	7 (1.5)	312 (67.2)	464 (100.0)		
Occupation	Employed housewife	44 (29.1)	4 (2.7)	103 (68.2)	151 (32.1)	$\chi^2 = 2.355^{NS}$ df = 2 p = 0.308	
	Total	147 (31.2)	7 (1.5)	317 (67.3)	471 (100.0)		
Household income (10,000won/month)	Less than 100	22 (40.7)	2 (3.7)	30 (55.6)	54 (11.5)	$\chi^2 = 8.478^{NS}$ df = 6 p = 0.205	
	100 - 149	37 (33.3)	1 (0.9)	73 (65.8)	111 (23.7)		
	150 - 199	45 (31.23)	3 (2.1)	96 (66.7)	144 (30.8)		
	200 or more	41 (25.8)	1 (0.6)	117 (73.6)	159 (34.0)		
	Total	145 (31.0)	7 (1.5)	316 (67.5)	468 (100.0)		
Food expense (10,000won/month)	Less than 30	34 (31.5)	4 (3.7)	70 (64.8)	108 (23.1)	$\chi^2 = 7.497^{NS}$ df = 6 p = 0.277	
	30 - 39	51 (35.2)	1 (0.7)	93 (64.1)	145 (31.1)		
	40 - 49	27 (27.8)	1 (1.0)	69 (71.1)	97 (20.8)		
	50 or more	31 (26.5)	1 (0.9)	85 (72.7)	117 (25.1)		
	Total	143 (30.6)	7 (1.5)	317 (67.9)	467 (100.0)		
Residence type	Singlefamily house	25 (34.7)	-	47 (65.3)	72 (15.2)	$\chi^2 = 4.053^{NS}$ df = 4 p = 0.133	
	Apartment	100 (29.5)	4 (1.2)	235 (69.3)	339 (71.5)		
	Multistory house	21 (33.3)	3 (4.8)	39 (61.7)	63 (13.2)		
	Total	146 (30.8)	7 (1.5)	321 (67.7)	474 (100.0)		

NS: not significant, **: $p < 0.01$ **Table 6.** Kinds of using flavor enhancer products in households

Variables	Group	MSG, GMP, IMP	Complex powder	Liquid-type	Total	P value	N (%)
Age (years)	Younger than 35	8 (10.3)	69 (88.5)	1 (1.3)	78 (16.9)	$\chi^2 = 17.862^{**}$ df = 6 p = 0.007	
	35 - 39	17 (11.7)	117 (80.7)	11 (7.6)	145 (31.4)		
	40 - 44	24 (16.7)	107 (74.3)	13 (9.0)	144 (31.2)		
	45 or older	25 (26.3)	66 (69.5)	4 (4.2)	95 (20.6)		
	Total	74 (16.0)	359 (77.7)	29 (6.3)	462 (100.0)		
Education level	Middle school or lower	16 (34.0)	30 (63.8)	1 (2.1)	47 (10.4)	$\chi^2 = 18.881^{**}$ df = 4 p = 0.001	
	High school	41 (15.2)	216 (80.0)	13 (4.8)	270 (60.0)		
	College or higher	17 (12.8)	101 (75.9)	15 (11.3)	133 (29.6)		
	Total	74 (16.4)	347 (77.1)	29 (6.4)	450 (100.0)		
Occupation	Employed housewife	22 (14.5)	117 (77.0)	13 (8.6)	152 (33.3)	$\chi^2 = 2.519^{NS}$ df = 2 p = 0.284	
	Full-time housewife	51 (16.8)	238 (78.3)	15 (4.9)	304 (66.7)		
	Total	73 (16.0)	355 (77.9)	28 (6.1)	456 (100.0)		
Household income (10,000won/month)	Less than 100	13 (25.5)	36 (70.6)	2 (3.9)	51 (11.2)	$\chi^2 = 17.515^{**}$ df = 6 p = 0.008	
	100 - 149	16 (14.6)	91 (82.7)	3 (2.7)	110 (24.2)		
	150 - 199	22 (15.8)	112 (80.6)	5 (3.6)	139 (30.6)		
	200 or more	22 (14.3)	113 (73.4)	19 (12.3)	154 (33.9)		
	Total	73 (16.1)	352 (77.5)	29 (6.4)	454 (100.0)		
Food expense (10,000won/month)	Less than 30	15 (14.2)	87 (82.1)	4 (3.8)	106 (23.4)	$\chi^2 = 13.682^*$ df = 6 p = 0.033	
	30 - 39	19 (13.7)	115 (82.7)	5 (3.6)	139 (30.7)		
	40 - 49	16 (17.0)	73 (77.7)	5 (5.3)	94 (20.8)		
	50 or more	23 (20.2)	77 (67.5)	14 (12.3)	114 (25.2)		
	Total	73 (16.1)	352 (77.7)	28 (6.2)	453 (100.0)		
Residence type	Singlefamily house	21 (30.0)	46 (65.7)	3 (4.3)	70 (15.3)	$\chi^2 = 17.657^{**}$ df = 4 p = 0.001	
	Apartment	40 (12.2)	264 (80.2)	25 (7.6)	329 (71.7)		
	Multistory house	13 (21.7)	46 (76.7)	1 (1.7)	60 (13.1)		
	Total	74 (16.1)	356 (77.6)	29 (6.3)	459 (100.0)		

NS: not significant, *: $p < 0.05$, **: $p < 0.01$

Table 7. Place of purchasing flavor enhancer products in households

Variables	Group	Department store	Wholesale mart	Market	Near retail store	Total	N (%)	p value
Age (years)	Younger than 35	3 (3.7)	66 (80.5)	-	13 (15.9)	82 (17.1)	$\chi^2 = 15.668^{NS}$ df = 9 p = 0.074	
	35 - 39	9 (6.2)	112 (77.2)	-	24 (16.6)	145 (30.2)		
	40 - 44	12 (7.8)	111 (72.1)	2 (1.3)	29 (18.8)	154 (32.0)		
	45 or older	8 (8.0)	60 (60.0)	2 (2.0)	30 (30.0)	100 (20.8)		
	Total	32 (6.7)	349 (72.6)	4 (0.8)	96 (20.0)	481 (100.0)		
Education level	Middle school or lower	4 (8.0)	26 (52.0)	2 (4.0)	18 (36.0)	50 (10.7)	$\chi^2 = 18.970^{**}$ df = 6 p = 0.004	
	High school	17 (6.0)	218 (77.0)	1 (0.4)	47 (16.6)	283 (60.3)		
	College or higher	10 (7.4)	96 (70.6)	1 (0.7)	29 (21.3)	136 (29.0)		
	Total	31 (6.6)	340 (72.5)	4 (0.9)	94 (20.0)	469 (100.0)		
Occupation	Employed housewife	13 (8.3)	108 (69.2)	1 (0.6)	34 (21.8)	156 (32.9)	$\chi^2 = 1.971^{NS}$ df = 3 p = 0.578	
	Full-time housewife	18 (5.7)	236 (74.2)	3 (0.9)	61 (19.2)	318 (67.1)		
	Total	31 (6.5)	344 (72.6)	4 (0.8)	95 (20.0)	474 (100.0)		
Household income (10,000won/month)	Less than 100	2 (3.6)	36 (65.5)	2 (3.6)	15 (27.3)	55 (11.7)	$\chi^2 = 18.805^*$ df = 9 p = 0.027	
	100 - 149	12 (10.6)	72 (63.7)	1 (0.9)	28 (24.8)	113 (23.9)		
	150 - 199	10 (6.9)	111 (76.6)	-	24 (16.6)	145 (30.7)		
	200 or more	8 (5.0)	126 (79.3)	1 (0.6)	24 (15.1)	159 (33.7)		
	Total	32 (6.8)	345 (73.1)	4 (0.9)	91 (19.3)	472 (100.0)		
Food expense (10,000won/month)	Less than 30	2 (1.8)	86 (76.8)	1 (20.5)	23 (20.5)	112 (23.8)	$\chi^2 = 9.364^{NS}$ df = 9 p = 0.404	
	30 - 39	10 (7.0)	99 (69.2)	2 (1.4)	32 (22.4)	143 (30.4)		
	40 - 49	2 (7.1)	72 (72.7)	1 (1.0)	19 (19.2)	99 (21.0)		
	50 or more	12 (10.3)	85 (72.7)	-	20 (17.1)	117 (24.8)		
	Total	31 (6.6)	342 (72.6)	4 (0.9)	94 (20.0)	471 (100.0)		
Residence type	Singlefamily house	5 (6.6)	49 (64.5)	2 (2.6)	20 (26.3)	76 (15.9)	$\chi^2 = 10.480^{NS}$ df = 6 p = 0.106	
	Apartment	25 (7.4)	249 (73.9)	1 (0.3)	62 (18.4)	337 (70.5)		
	Multistory house	1 (1.5)	51 (78.5)	1 (1.5)	12 (18.5)	65 (13.6)		
	Total	31 (6.5)	349 (73.0)	4 (0.8)	94 (19.7)	478 (100.0)		

NS: not significant, *: $p < 0.05$, **: $p < 0.01$

in the figures for the places where housewives purchased flavor enhancer products among groups divided by occupation, food expenditures and residence type. However, younger housewives tended to buy them more at wholesale marts than at retail stores, although the difference was not significant ($p = 0.074$).

As stated, this survey was carried out using a self-administered questionnaire from August 1 to 31, 1999 for the purpose of investigating the use of flavor enhancer products by Korean housewives in the Incheon area. The subjects were 600 housewives living in Incheon. For statistical analysis, 503 well-completed questionnaires were used from a total of 505 collected (collection rate: 84.2%). The results are summarized as follows: Most housewives used flavor enhancer products (89.2% or more). Housewives with higher educations ($p = 0.001$) and employed housewives ($p = 0.01$) used significantly less flavor enhancer. The main reasons cited for nonuse of flavor enhancer products was harmfulness to health (52% or more) and not necessary (40% or more). Housewives mainly used flavor enhancer products in stews (42.9% or more) and whole dishes (41.2% or more). Most housewives used flavor enhancer products 1-2 times per day (78.2% or

more) and housewives with higher educations ($p = 0.001$) and employed housewives ($p = 0.018$) used flavor enhancer products less frequently. In terms of their own perceived use of flavor enhancer products, housewives cited small amounts in 67.2% or more of the cases, moderate amounts in 30.6% or more and large amounts in 1.5% of cases. Housewives with higher educations reported using significantly smaller amounts of flavor enhancer ($p = 0.003$). There were significant differences in the kinds of flavor enhancer products used by housewives divided by age ($p = 0.007$), education level ($p = 0.001$), household income ($p = 0.008$), food expenditures ($p = 0.033$) and residence type ($p = 0.001$). As for the places where flavor enhancer products were purchased, housewives reported wholesale marts (72.6% or more), near retail stores (19.3% or more), department stores (6.5% or more) and markets (0.8% or more). There were significant differences in the figures for the places where housewives purchased flavor enhancer products among groups divided by education level ($p = 0.004$) and household income ($p = 0.027$). In conclusion, it may be necessary to develop safer and more variously flavored flavor enhancer products in accordance with housewives' needs and socioeconomic levels.

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