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Analysis of Acesulfame K Sweetener on Elementary School Student's Snacks in South Denpasar Sub-district

I Dewa Ayu Ketut Yunantariningsih, Ni Made Ayu Suardani Singapurwa*, I Wayan Sudarta, I Nyoman Rudianta, I Putu Candra
Study Program of Food and Technology Science, Faculty of Agriculture, Universitas Warmadewa, Indonesia

Abstract

This study aims to determine the content and levels of Acesulfame K sweetener in unmarked beverages without labels prepared and sold by elementary school canteens in South Denpasar subdistrict. This research is a type of descriptive research that uses survey methods with simple random sampling techniques and experiments in the laboratory. The number of primary schools in South Denpasar District is 72 schools. The population in this study were 145 types of unmarked beverages without labels that were prepared and sold by elementary school canteens in South Denpasar District. The number of samples sampled are 110 samples from 145 existing populations. The parameters of artificial sweetener in this research were Acesulfame K which was tested by HPLC. The research data are presented in tables, graphs and analyzed descriptively. The results showed that of 110 samples containing 49 acesulfame K samples (44.55%) and acesulfame K levels all samples met the requirements in accordance with the maximum allowable limit referring to the Head of POM (National Agency of Drug and Food Control) RI Regulation Number 4 of 2014.

Keywords: Artificial sweetener, acesulfame K, hawker food

Author Correspondence:

Ni Made Ayu Suardani Singapurwa
Food Science and Technology Department, Faculty of Agriculture, Universitas Warmadewa, Indonesia
E-mail: a.suardani@gmail.com

1. Introduction

Hawker food is food or drinks that can be directly consumed that can be purchased from food vendors, both produced by the seller or produced by other people, without further processing (1) Snack food for school children is snacks that are sold in the school environment and routinely consumed by most school children. Food safety of snacks is still needed to get attention because of the use of illegal additives, the use of food additives exceeds permitted levels and the quality and safety of microbiological that does not meet the requirements (2).

According to (3), material added within food to influence the nature or form of food. One food additive that is often used is artificial sweeteners. Currently, there are still many uses of artificial sweeteners in a variety of foods and beverages that are sold freely with levels that exceed the threshold. These foods and drinks are generally preferred by children because they are combined with attractive colors and are formed as cold drinks.

According to unit implementer of task (UPT), data from the South Denpasar Youth and Sports Education Office, South Denpasar District consists of 8 villages that consists of 72 elementary schools. Based on a preliminary survey of the types of snacks that sold by school, namely main foods such as packaged rice, fried rice, fried noodles, and snacks/snacks that have been licensed. Whereas drinks sold are packaged drinks that have been labeled with marketing license and unmarked beverages that are prepared and sold by school canteen traders such as syrup ice, tea and others. So that in this study focused on the type of drink without a brand or a label that is prepared and sold by the school canteen

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Author Correspondence:

⁸ Made Ayu Suardani Singapurwa

Food Science and Technology Department, Faculty of Agriculture, Universitas Warmadewa, Indonesia

E-mail: a.suardani@gmail.com

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trader.

Based on the description above, the use of artificial sweeteners is still found to exceed the maximum allowable usage, consequently it will pose a risk to health for those who consume it. Therefore, research will be conducted on the analysis of the content⁵ of Acesulfame K sweetener in elementary school children's snacks in the District of South Denpasar. The purpose of this study is to determine the content of Acesulfame K artificial sweeteners in unmarked beverages without labels prepared and sold by traders in the elementary school canteen in South Denpasar District and to determine the levels of Acesulfame K sweeteners on unmarked beverages without labels prepared and sold by traders in elementary school canteens in South Denpasar Sub-district are eligible or not with the maximum allowable limit.

2. Materials and Methods

Time and Location of Research

The survey in this study was conducted in elementary schools in South Denpasar District. As for the testing of artificial sweeteners carried out at the Central Laboratory of POM (National Agency of Drug and Food Control) Chemistry in Denpasar. This research was conducted in January - July 2019.

Experimental design

This type of research is descriptive research. According to (4)³ that descriptive research is research that seeks to describe a phenomenon, event, event that is happening at the present time (5). This research uses survey and experimental methods in the laboratory.

Population and Sample

Determination of the population in this study⁴ was done by purposive sampling which is a drink without a brand without a label that is prepared and sold by traders in the primary school canteen in South Denpasar District. The population is 145 drinks from 72 elementary schools.

The sample is the portion of the population to be studied or a portion of the number of characteristics possessed by the population (6). The determination of the school canteen sampled for sampling is done at random (simple random sampling). The sampling technique was carried out once for each trader in the school canteen. In one sample school canteen that is included in the sample criteria will be sampled entirely. Based on the Slovin Formula (7) namely the determination of the minimum number of samples to be examined with a defined margin of error of 5% (95% confidence level), the calculation is as follows:

$$n = \frac{N}{(1 + (N \times e^2))}$$

Where n is the sample, N is the population and e is the margin of error (5%). With the Slovin formula, the minimum number of samples to be studied is 106 samples from 145 existing populations.

Research Implementation

The study was divided into 4 stages: 1) a preliminary survey of elementary schools in South Denpasar Subdistrict to see the profile of snacks for school children sold in primary school canteens in South Denpasar Subdistrict 2) conducting sampling at randomly selected primary schools for sweetener

sampling according sample criteria 3) analysis of Acesulfame K in samples by HPLC (High Performance Liquid Chromatography) in the laboratory, 4) data processing.

Data Analysis

The data were analyzed descriptively accompanied by discussion and conclusions. The results obtained are presented in tabular form with narration. The results of the study will refer to (8) on the Maximum Limit of Using Sweetener Additives.

3. Results and Discussion

Results of Acesulfame K Content Test

Based on the sampling results, obtained 110 minimum samples in accordance with sample criteria which is including 51 colored drinks (46%), 36 ice lollies samples (33%), 16 tea drinks samples (14%), mixed ice 3 samples (3%), and other beverages 4 samples (4%). The results of the analysis of artificial sweeteners of Acesulfame K in the sample can be seen in Table 1 to Table 5.

Table 1.
Results of Artificial Sweeteners Test in Colored Drinks

School Code	Colored Drinks	Level of Acesulfame K (mg/kg)	Maximum Limit
B, F, G, Y, CC, Q, T, V	Chocolate	Undetected	
D	Chocolate	29.09	
I	Chocolate	168.14	
M	Chocolate	53.12	2
AA	Chocolate1	257.05	600 mg/kg
AA	Chocolate2	80.56	
BB	Chocolate	249.03	
P	Chocolate	172.76	
A	Green	26.92	
C, Z, FF	Green	Undetected	
N	Green	11.28	600 mg/kg
Y	Green	31.50	
AA	Green	45.17	
BB	Green	204.44	
S	Green	88.42	
V	Green	93.45	
Code of School	Colored Drinks	Level of Acesulfame K (mg/kg)	Maximum Limit
O	Red	32.28	
AA	Red	189.54	600 mg/kg
C, M, FF	Yellow	Undetected	
N	Yellow	29.95	600 mg/kg
H, Q, V	White	110.16	
M	White	54.48	600 mg/kg
H	Orange	140.19	
AA	Orange	61.47	600 mg/kg
FF	Orange	Undetected	
AA	Purple	177.26	
BB	Purple	220.20	600 mg/kg
CC	Purple	94.87	
F	Blue	18.43	
I	Blue	150.19	600 mg/kg
CC	Blue	86.16	
Containing of Acesulfam K		27 sample	Total sampel:51
Does not contain Acesulfam K		24 sample	
Qualify		51 sample (100%)	

Table 2.
Results of Sweetener Test on Ice Lolly

School Code	Ice Lolly / Ice Stick *	Level of Acesulfam K (mg/kg)	Maximum Limit
C, E, BB	Chocolate	Undetected	500 mg/kg
K	Chocolate	60.55	
U	Chocolate	89.63	
DD	Chocolate	230.20	
E, E, G, L, EE	Orange	Undetected	500 mg/kg
DD	Orange	243.58	
C, G, O, L	Red	Undetected	500 mg/kg
BB	Red	74.36	
E, G, EE	Yellow*	Undetected	500 mg/kg
K	Yellow	93.02	
DD	Yellow	304.16	
E, G, EE	Green	Undetected	500 mg/kg
BB	Green	68.94	
U	Green	80.88	
O, L	White	Undetected	300 mg/kg
K	White	94.55	
DD	White	308.55	
E	Blue	Undetected	500 mg/kg
School Code	Ice Lolly / Ice Stick*	Level of Acesulfam K (mg/kg)	
K	Blue	160.15	
DD	Blue	209.35	
K	Purple	69.45	
BB	Purple	80.07	
Containing of Acesulfam K		15 sample	Total sample: 36
Does not contain Acesulfam K		21 sample	
Qualify		36 (100%)	

Table 3.
Results of Sweeteners on Tea Drink

School Code	Colored Drinks	Level of Acesulfam K (mg/kg)	Maximum Limit
R	Tea	Undetected	600 mg/kg
R	Iced tea	Undetected	
J	Tea	Undetected	
X	Tea	Undetected	
X	Iced tea	127.06	
Y	Tea	76.52	
AA	Tea	158.77	
P	Tea	287.46	
S	Tea	170.87	
T	Tea 1	Undetected	
T	Tea 2	157.20	
W	Tea	130.13	
GG	Iced Cup Tea	Undetected	600 mg/kg
HH	Iced Cup Tea	Undetected	
II	Iced Cup Tea	t.t	
II	Cup tea	t.t	
Containing of Acesulfam K		7 sample	Total sample: 16
Does not contain Acesulfam K		9 sample	
Qualify		16 (100%)	

Table 4.

Results sweetener Test on Mixed fruit ice dessert

School Code	Mixed fruit ice dessert	Level of Acesulfam K (mg/kg)	Maximum Limit
R	Mixed fruit ice dessert	Undetected	600 mg/kg
V	Mixed fruit ice dessert	Undetected	
II	Mixed fruit ice dessert cup	Undetected	
Containing of Acesulfam K		0 sample	Total sample: 3
Does not contain Acesulfam K		3 sample	
Qualify		3 (100%)	

Table 5

Test Results on other Beverages

School Code	Beverages	Level of Acesulfam K (mg/kg)	Maximum Limit
A	Young coconut	Undetected	600 mg/kg
A	Grass jelly ice	Undetected	
GG	Cup young coconut	Undetected	
II	Cup orange ice	Undetected	
Containing of Acesulfam K		0 sample	Total sample 4
Does not contain Acesulfam K		4 sample	
Qualify		4 (100%)	

Acesulfame K

Table 1 shows the results of the Acesulfame K sweetener in 51 colored beverage samples. Based on quantitative test results, there were 24 samples that did not contain Acesulfame K (not detected) and 27 samples contained Acesulfame K with the smallest levels of 11.28 mg / kg, which were found in the largest green drinks 257.05 mg / kg in brown drinks. The level of Acesulfame K in the sample fulfills the requirements that is not to exceed the maximum allowable limit of 600 mg / kg. Table 2 shows the results of the Acesulfame K sweetener in 36 ice wax samples. Based on the results of quantitative tests there were 21 samples that did not contain Acesulfame K (not detected) and 15 samples contained Acesulfame K with the lowest levels of 60.55 mg / kg found in chocolate ice wax and the largest content of 308.55 mg / kg in white ice wax. The levels of Acesulfame K in the ice pops are all met the requirements, namely not to exceed the maximum allowable limit of 500 mg / kg for ice popsicles.

Table 3 shows the results of the Acesulfame K sweetener in 16 tea drink samples. Based on quantitative test results, there were 9 samples that did not contain Acesulfame K (not detected) and 7 samples contained Acesulfame K with the smallest level of 76.52 mg / kg and the largest concentration of 170.87 mg / kg. The level of Acesulfame K fulfills the requirement that it does not exceed the maximum allowable limit of 600 mg / kg. Table 4 shows the results of the Acesulfame K sweetener in 3 mixed ice samples. Based on the quantitative test results, the three mixed ice samples did not contain Acesulfame K (not detected). This shows that the three samples of mixed ice meet the maximum allowable limit for acesulfame K in mixed ice which is 600 mg / kg. Table 5 shows the results of Acesulfame K sweetener in 4 beverage samples. Percentage of Acesulfame K test results can be seen in graph 1. Based on the test results of the four samples do not contain Acesulfame K (not detected). This means that the Acesulfame K content in the sample meets the maximum allowable limit for drinks which is 600 mg / kg. Several studies have shown that acesulfam-K is indigestible, non-glycemic and non-carcinogenic, safe for human consumption as artificial sweetener with ADI as much as 15 mg / kg

body weight (9).

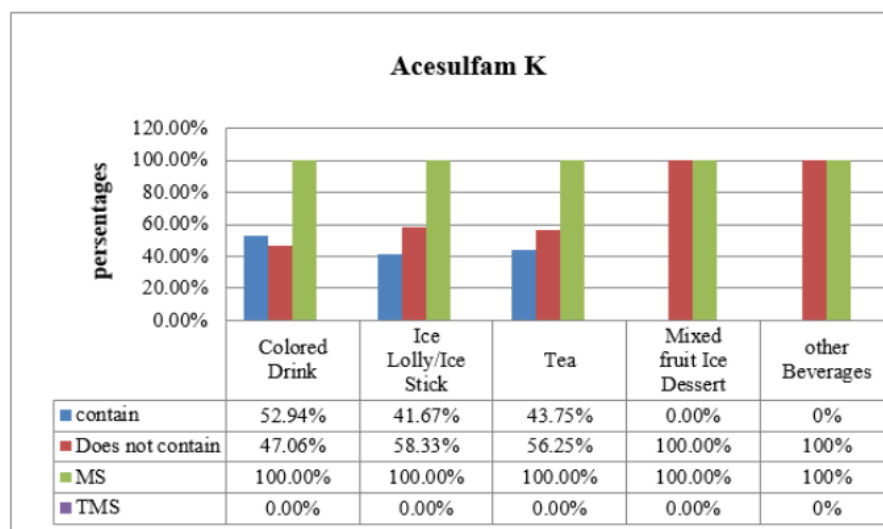


Figure 1.
Grafik of Asesulfam K

4. Conclusion

Based on the results of laboratory tests of 110 test samples containing 49 acesulfam K samples (44.55%) and did not contain 61 acesulfam K samples (55.45%). The level of artificial sweetener in 110 beverage samples obtained the results for the levels of Acesulfame K, all of them still meet the maximum allowable limits.

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