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การตรวจหาการปนเปื้อนซัลไฟต์ในไข่เยี่ยวม้าและผลิตภัณฑ์อาหารแห้งนำเข้าตรวจโดยชุดตรวจ ALERT Sulfite Detection Kit

Sulfite Contamination in Century Eggs and Imported Dry Products Using ALERT Sulfite Detection Kit

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บทคัดย่อ

โซเดียมไฮโดรซัลไฟต์ ($Na_2S_2O_4$) เป็นสารเติมแต่งอาหารที่ใช้เป็นสารต้านอนุมูลอิสระและสารฟอกขาวเพื่อป้องกันการเกิดออกซิเดชันในผลิตภัณฑ์อาหาร ช่วยคงสีสันและยับยั้งการเจริญเติบโตของจุลินทรีย์ที่นำไปสู่การเน่าเสียของผลิตภัณฑ์อาหาร อย่างไรก็ตามโซเดียมไฮโดรซัลไฟต์ในอาหารก่อให้เกิดภาวะภูมิไวเกินประเภทที่ 1 และลดประสิทธิภาพขบวนการโปรตีนเมตาโบลิซึม ดังนั้นจึงมีการควบคุมปริมาณโซเดียมไฮโดรซัลไฟต์ในอาหารอย่างเคร่งครัด การศึกษาวิจัยในครั้งนี้จึงมีวัตถุประสงค์เพื่อให้ทราบถึงสถานการณ์การตกค้างของสารโซเดียมไฮโดรซัลไฟต์ในผลิตภัณฑ์อาหารบางชนิดในกรุงเทพฯ เพื่อเป็นข้อมูลและแนวทางในการตัดสินใจเลือกซื้อผลิตภัณฑ์อาหารในกลุ่มผู้บริโภคที่มีความเสี่ยงต่อการแพ้สารเคมีดังกล่าว

ตัวอย่างอาหารจำนวน 75 ตัวอย่างถูกคัดเลือกและซื้อจากสถานที่ต่างๆ 9 แห่งในเขตกรุงเทพฯ และปริมณฑล เพื่อตรวจหาซัลไฟต์ตกค้าง โดยมีกลุ่มตัวอย่างที่แตกต่างกัน 5 กลุ่ม ได้แก่ ปลาหมึก ไข่เยี่ยวม้า ตีนไก่ ผลิตภัณฑ์อบแห้งและผลไม้อบแห้ง จากนั้นนำตัวอย่างมาหั่นเป็นชิ้นเล็กๆ และทำการทดสอบเพื่อตรวจระดับซัลไฟต์ตกค้างโดยใช้ ALERT Sulfite Detection Kit

ผลการวิจัยพบว่ามีการปนเปื้อนของซัลไฟต์ในตัวอย่างอาหารที่สนใจทั้งสิ้น 28 จาก 75 ตัวอย่าง คิดเป็น 37.33% ผลิตภัณฑ์ที่มีการปนเปื้อนมากที่สุดคือไข่เยี่ยวม้า โดยพบการปนเปื้อนทั้งหมด 9 ตัวอย่าง จากตัวอย่างไข่เยี่ยวม้าที่ใช้ทดสอบ 14 ตัวอย่าง รองลงมาคือ ผลไม้แห้ง ผักแห้ง ปลาหมึก และตีนไก่ตามลำดับ

จากผลการทดสอบทั้งหมดสรุปได้ว่า ผลิตภัณฑ์ที่ผ่านการแปรรูปและถนอมอาหารหรือต้องเก็บรักษาเป็นเวลานานจะมีความเข้มข้นของซัลไฟต์เพิ่มขึ้น เห็นได้ชัดจากผลลัพธ์ที่แสดงให้เห็นว่าความเข้มข้นของซัลไฟต์ในผลิตภัณฑ์สด เช่น ตีนไก่และปลาหมึก น้อยกว่าผลิตภัณฑ์ถนอมอาหาร เช่น ไข่เยี่ยวม้าและอาหารแห้ง ดังนั้นผู้บริโภคที่มีความเสี่ยงต่อสารเคมีประเภทซัลไฟต์ควรงดอาหารที่ผ่านการถนอมอาหารแล้วหันมาบริโภคผลิตภัณฑ์ที่สดใหม่และปลอดสารพิษแทน

คำสำคัญ: ซัลไฟต์ตกค้าง สารฟอกขาว ภูมิแพ้อาหาร สารปนเปื้อนในอาหาร สารปรุงแต่งอาหาร

Abstract

Sodium hydrosulfite (Na2S2O4) is a food additive used as an antioxidant and a whitening agent to prevent oxidation in food products. It helps maintain color and inhibits the growth of bacteria that lead to spoilage of food products. However, sodium hydrosulfite in food can cause hypersensitivity reactions of type 1 and decrease the efficiency of protein metabolism. Therefore, controlling the amount of sodium hydrosulfite in food is crucial. The objective of this research is to investigate the situation of sodium hydrosulfite residues in certain food products in Bangkok in order to provide information and guidelines for consumers who are at risk of chemical hypersensitivity when selecting food products.

A total of 75 food samples were selected and bought from 9 different locations in Bangkok Metropolitan Region to be examined for sulfite residue. There were 5 different sample groups; Squids, Century eggs, Chicken feet, Dried products and dried fruits. The sample was then cut into smaller pieces. The Alert Sulfite detection kit was used to determine sulfite residue levels.

The result revealed that there was sulfite residual contamination in a total of 28 out of 75 samples of the food of interest, representing 37.33%. The product with the highest level of contamination was century eggs, with a total of 9 contaminated samples out of 14 tested. The next highest level of contamination was found in dried fruits, dry vegetable, squid, and chicken feet, respectively.

It was summarized that the concentration of sulfites increases in food products that required extensive periods of preservation. Preserved food products such as preserved eggs and dried food have a higher concentration of sulfites compared to fresh products such as chicken feet and squid. This indicates that individuals who are susceptible or vulnerable to sulfite exposure should avoid consuming preserved food products and instead choose fresh, and organic products food products.

Keywords: sulfite residues, bleaching reagent, food allergy, food contamination, food additives

Introduction

Food contaminants refer to substances or chemicals that are not intended to be present in the food. These contaminants may come from the manufacturing process such as production, packaging, as well as transportation and storage of the food product [1]. Nowadays, many chemicals are used in the food industry in order to achieve and meet the customer's demands in taste, visuals, and smell. Unfortunately, many of these inorganic chemicals are harmful to the body. if consumed in large quantities, it can be fatal. [2] Harmful chemicals are often found to be contaminated in food and the Bureau of Quality and Safety of Food (BQSF) has been probing both imported and local food products in hopes of eliminating the harmful chemicals.[3] There are 3 types of contamination of food. The first type is physical contamination

which refers to food that has been contaminated by a foreign substance at a certain stage of the production process. The second type is biological contamination which refers to food that has been contaminated by a substance produced by living creatures (bacterias, fungus, etc). The third type is chemical contamination, which refers to food that has been contaminated by some type of chemical substance (both organic and inorganic). [4]

Food additives are a common type of possible chemical contaminant. They can be categorized into 20 different subcategories. Anti-caking agents such as sodium bicarbonate ($NaHCO_3$) and silicon dioxide (SiO_2) are used to prevent the clumping and caking of dry powdered products.[5] Anti-caking agents such as SiO_2 absorb water to produce silicic acid (H_2SiO_3), preventing the hydration of the powered products. Antioxidants such as ascorbic acid ($C_6H_8O_6$) are used to inhibit the oxidation of phenolic compounds and prevent free radical damage in organic products slowing down the natural process of enzymatic browning. [6]. Another type of additives is bleaching agents. Bleaching agents such as benzoyl peroxide ($C_{14}H_{10}O_4$) are used to whiten or lighten the appearance of the designated food product in order to increase consumer satisfaction. [7] Due to the fact that benzoyl peroxide oxidizes carotenoids (natural yellow pigment) in unprocessed flour, the flour becomes much whiter in color due to the color absorption of the resulting products not being in the visible spectrum. [8] Other notable types of food additives are artificial sweeteners, emulsifiers, food acids, humectants, flavor enhancers, foaming agents, mineral salts, preservatives, thickeners, stabilizers, glazing agents, gelling agents, propellants, raising agents, and bulking agents. [5] Although food additives generally provide food manufacturing companies with solutions to many natural occurring issues hence reducing customer complaints, many health risks arise with the use of these additives. [9]

Sodium Hydrosulfite ($Na_2S_2O_4$) also known as sodium dithionite is a highly soluble inorganic compound that possesses strong reducing properties and acts as an antioxidant. Sodium hydrosulfite is used in many different industrial fields such as dyeing, printing, bleaching, etc.[10] Most importantly, it is also used as an additive in the food industry to improve the visuals, shelf life, and the ability to prolong the nutrition quality and content of foods.[11] Sodium Hydrosulfite is used in dried fruits and jams to prevent enzymatic browning. By inhibiting the oxidation of polyphenolic compounds in the products, natural pigments such as melanin are not produced as a byproduct therefore no browning is observed. In baking, sodium bisulfite is used as an economical alternative to common reducing agents, mainly in cookie and cracker formulations. With prolongation of the nutrition, it can contrastingly reduce the vitamin B1 (thiamine) content in meat and fruits. However, sodium hydrosulfite yields many side effects if large amounts are consumed, which includes bronchoconstriction, wheezing, dyspnea, nausea, stomach cramps, diarrhoea, urticaria/angioedema, diaphoresis, hives, laryngeal oedema, generalised itching and swelling, tingling sensations, flushing, hypotension, cyanosis, shock and loss of consciousness.[12] Long term effects resulting from the intake of sodium hydrosulfite are damages to the villi in the stomach and intestines causing gastrointestinal cancer, thus making sodium hydrosulfite a possible carcinogen. Sodium hydrosulfite is also known to be an effective factor in causing diabetes.[13] According to the European Union (EU), levels

of sodium hydrosulfite in foods and drinks above 10 mg/kg or 10 mg per litre have to be labelled. Warning labels are now commonplace, yet in practice there is still a huge amount of ignorance and misinformation about the use of sulphites in food, drinks and pharmaceutical products. [12]

Sodium hydrosulfite has the property to whiten and lighten organic substances by using a chemical reaction called bleaching, which includes both oxidation and reduction reactions of certain compounds. Bleach has the ability to inhibit the discoloration of food such as thermal discoloration and enzymatic browning. Moreover, sodium hydrosulfite acts as a disinfectant, preventing the growth of yeast, mold, and bacteria. If consumers consume too much of sodium hydrosulfite, harm can be caused. The symptoms that occur will be different for each person. Normally, the human body has enzymes that convert bleach into sulfites that are not toxic to the body and are excreted in the urine. However, exposure to large amounts of bleach can be harmful to consumers. Consumers with asthma are a high-risk group to sodium hydrosulfite adverse reactions. Shock may occur which in the worst case can result in unconsciousness and death. The degree of severity of symptoms depends on the amount taken. In addition, this substance can interact with certain vitamins such as thiamine, leading to the risk of thiamine deficiency. Moreover, if taken continuously for a long time, it will accumulate toxins and interfere with the function of enzymes, causing negative effects on the metabolic system in the body.[14]

Food Standards Organization of Australia and New Zealand[15] or FSANZ set the standard criteria for sodium hydrosulfite in food (Maximum Permitted Level: MPL) not exceeding 1,000 mg/kg. from the report of Department of Medical Sciences that has randomly checked for bleach 2,438 samples of bean sprouts, pickled bamboo shoots, shredded ginger, fresh fruits, palm sugar, and durian paste were contaminated with sodium hydrosulfite in 392 samples, representing 16%. This is considered a situation of chemical contamination in food that is very harmful to consumers.[3]

There are many situations where sodium hydrosulfite contamination was found in many countries. Izanloo and colleagues investigated sodium dithionite as an additive in traditional bread and discovered that 40% of all samples contained contaminated sodium dithionite at a concentration of 1.23±0.99 ppm.[16] In Thailand, between 2005 and 2014, 621 samples of imported dried fruits and vegetables were tested for sulfur dioxide, including white ear mushrooms, Chinese flowers, bamboo pulp, Chinese jujubes, and herbs, and it was discovered that sulfite contamination in the samples inspected exceeded the limit by 34%.[3]

The purpose of this study was to determine the presence of sodium hydrosulfite residue in the following foods; Dry food, Frozen squid, Century eggs and chicken feet which could be harmful to consumer health according to the Department of Health, Ministry of Public Health's food sanitation standards, Thailand Testing can be done by collecting samples for the study in various fresh markets in Bangkok and testing them with an alert for sulfite contamination test kit. This information can then be used as a guideline to communicate to consumers about the safety of consuming various foods that may contain contaminating additives in foodstuffs. Creating confidence or awareness of potential risks in order

for consumers who are susceptible to allergic reactions to sulfites in food to take precautions when consuming those foods.

Material and Methods

A cross-sectional used to survey the present study to experiment with food additive contamination in accordance with food sanitation guidelines and any notifications from the Ministry of Public Health. The investigation was conducted in several of Bangkok's fresh marketplaces. Data was gathered during November and December 2022.

Sample size calculation

The sample size was calculated using the formula based on the mean percentage incidence detected in previous studies involving sulfite contamination in food samples by Izanloo et al[11] and Kitcharoenwong et al[1] as below:

$$N = \frac{Z^2_{\alpha/2} P(1-P)}{e^2}$$

Where

n = sample size; P = Mean percent incidence detected; Z = confidence level (in this research, 95% confidence level, Z= 1.96); and e = the proportion of error allowed (20%)

The sample size required was 23 samples. However, in the present study we used a total of 75 food samples for increasing sensitivity and divided them into 5 food samples groups.

Sample food used for testing

Make 5 preliminary food samples, including squids, Century eggs, chicken feet, dried products, and dried fruits by random methods, and collect 5 types of samples from various markets in Bangkok.

Sample preparation and Screening for sulfite residue

The 75 chosen samples is crushed into equal sizes prior to the experiment. The Alert Sulfite detection kit (Neogen Corporation #9500) was used to determine residue sulfite levels. This method is linked to the Monier-Williams AOAC method.[17] The food sample area received one drop of the activator solution. The moistened meat was then treated with one drop of dye reagent. The color change was noticed after one minute. If the blue dye did not change color, the food sample contained sulfite levels less than 10 ppm (detection limit). If the blue dye turned violet, the food sample was sulfite-treated, but the sulfite level did not exceed 100 ppm (0-100 ppm). If no dye color remained, the sulfite level

exceeded 100 ppm (>100 ppm). Positive and negative control foods were also tested with known amounts of bisulfite to confirm the color change with known levels of sulfite exposure.

Results

In this investigation, a total of 75 individual food products are tested and sampled for sulfite residue. The samples are collected and purchased from 9 different locations in Bangkok's Metropolitan Region to ensure a well-rounded sampling area. The samples can be categorized into 5 different sample groups which are squids, century eggs, chicken feet, dried products, and dried fruits. The sample groups are further divided into subcategories according to their characteristics (fresh, dried, frozen, etc). A total of 13 food products are placed under the squid category, 14 food products each under both century egg and chicken feet, and 17 each under both dried products and dried fruits. During the sampling, the number of samples for each subcategory are recorded in detail as well as the physical qualities such as colour and shape, which will be used to determine the method of sulfite sampling used on each food product.

Table 1: Physical Qualities and Location of Purchase for the 75 Different Food Products and Food Types Tested for Sulfite Residue

Sample Group	Sample Name	Number of Samples	Physical Qualities	Location of Purchase
Squids	Fresh Squid	4	Off-White, Soft, Rounded	Taweewattana District Dao Kanong District Pathum Thani District
	Frozen Squid	8	Off-White, Soft, Rounded	Taweewattana District Tung Khru District Taling Chan District Bang Bon District Ratchathewi District
	Dried Squid	1	Brown, Rigid, Flat, Wrinkled	Kannayao District
Century Eggs	Century Egg	14	Jelly-Like, Brownish Color	Bang Plee District Taweewattana District Tung Khru District

Sample Group	Sample Name	Number of Samples	Physical Qualities	Location of Purchase
				Taling Chan District Kannayao District Pathum Thani District Bangkae District Dao Kanong District Ratchathewi District
Chicken Feet	Bone-in Chicken Feet	10	Pinkish White, Soft Exterior	Bang Plee District Taweewattana District Bangkae District Tung Khru District Taling Chan District Dao Kanong District Ratchathewi District Kannayao District
	No Bone Chicken Feet	4	Yellowish White, Soft	Lad Krabang District Thonburi District Pathum Thani District
Dried Products	Dried Bean Curd	1	Off-White, Long, Rigid and Rough	Kannayao District
	Dried Shiitake	2	Brown Exterior, White Interior, Crisp	Kannayao District Taling Chan District
	Dried Seaweed	3	Crisp Sheets, Black	Tung Khru District Taling Chan District Pathum Thani District
	Oyster Mushroom	4	White, rigid, with brown tint	Lad Krabang District

Sample Group	Sample Name	Number of Samples	Physical Qualities	Location of Purchase
				Dao Kanong District Ratchathewi District Pathum Thani District
	Dried Bamboo Pulp	2	White, tough but fluffy	Taweewattana District Tung Khru District
	Dried Goji	1	Reddish Orange, Tough and Dried	Taweewattana District
	Dried Day Lily	2	Crisp, Yellowish Brown	Kannayao District Ratchathewi District
	Dried Pen Shell	1	Bright Yellow, Rigid and Tough	Dao Kanong District
	Dried Chrysanthemum	1	Crisp, Yellowish Petals	Tung Khru District
Dried Fruits	Dried Pineapple	1	Bright Yellow, Tough and Rigid	Kannayao District
	Dried Kiwi	1	Green Slices, Rigid	Tung Khru District
	Dried Guava	1	Yellowish Green, Rigid	Tung Khru District
	Dried Lime	1	Brown, Tough and Sticky	Kannayao District
	Dried Apricot	1	Light Brown, Round, Soft	Ratchathewi District
	Dried Strawberry	3	Light Pinkish, Rough	Bangkae District Taling Chan District

Sample Group	Sample Name	Number of Samples	Physical Qualities	Location of Purchase
	Dried Persimmon	1	Grey exterior, Yellowish interior, Rigid	Bangkae District
	Dried Prunes	1	Blackish Purple, Soft	Bangkae District
	Dried Mixed Fruits	1	Yellowish Clumps, Hard and Rigid	Lad Krabang District
	Dried Plum	2	Creamish Brown, Soft	Lad Krabang District Pathum Thani District
	Dried Cherry Tomato	1	Bright Red, Dried, Tough	Pathum Thani District
	Dried Longan	1	Light Brown, Round, Soft	Ratchathewi District
	Dried Bananas	1	Light Yellow, Crisp and Hard	Dao Kanong District
	Dried Raisins	1	Brownish Red, Tough and Rigid	Dao Kanong District

According to Table 2, Century Eggs have the highest number of sulfite contaminated samples. Out of 14 century eggs sampled, 9 samples yielded a positive result from the ALERT sulfite test kit, which is 64.29% of the total century egg samples that is 12.00% of the total product. Out of 17 dried products tested, 6 dried products are sulfite positive which is 35.29% of the dried products that is 8% of the total product. Moreover, 6 out of 17 samples of dried fruit tested are contaminated with sulfite, which is 35.29% of the dried fruit samples. On the contrary, chicken feet are the least contaminated products with only 3 contaminated samples out of 14; 21.43% of the chicken feet or only 4.00% of the total.

In total, there were 75 samples tested for sulfite contamination using the ALERT Sulfite Detection Kit. Which 28 out of 75 samples or 37.33% of the samples are sulfite contaminated, however all of the samples do not exceed 100 ppm of sulfite.

Table 2: Analysis result of the amount and percentage of Sulfite residue found in the 75 different food samples.

Sample Group	Sample Name	Sulfite residue Testing		Total	Percentage in finding Sulfite within group (Percentage in finding Sulfite in total)
		Found	Not Found		
Squids	Fresh Squid	1 (10-100 ppm)	3	13	4 out of 13 30.77 (5.33)
	Frozen Squid	3 (10-100 ppm)	5		
	Dried Squid	0	1		
Century Eggs	Century Eggs	9 (10-100 ppm)	5	14	9 out of 14 64.29 (12.00)
Chicken Feet	Bone-in Chicken Feet	1 (10-100 ppm)	3	14	3 out of 14 21.43 (4.00)
	No Bone Chicken Feet	2 (10-100 ppm)	8		
Dried Products	Dried Bean Curd	1 (10-100 ppm)	0	17	
	Dried Shiitake	1 (10-100 ppm)	1		
	Dried Seaweed	1 (10-100 ppm)	2		

Sample Group	Sample Name	Sulfite residue Testing		Total	Percentage in finding Sulfite within group (Percentage in finding Sulfite in total)
		Found	Not Found		
	Dried Oyster Mushroom	0	4		
	Dried Bamboo Pulp	1 (10-100 ppm)	1		6 out of 17 35.29
	Dried Goji	0	1		(8.00)
	Dried Day Lily	1 (10-100 ppm)	1		
	Dried Pen Shell	1 (10-100 ppm)	0		
	Dried Chrysanthemum	0	1		
Dried Fruits	Dried Pineapple	1 (10-100 ppm)	0	17	6 out of 17 35.29
	Dried Kiwi	1 (10-100 ppm)	0		(8.00)
	Dried Guava	1 (10-100 ppm)	0		
	Dried Lime	0	1		
	Dried Apricot	1 (10-100 ppm)	0		
	Dried Strawberry	0	3		

Sample Group	Sample Name	Sulfite residue Testing		Total	Percentage in finding Sulfite within group (Percentage in finding Sulfite in total)
		Found	Not Found		
	Dried Persimmon	0	1		
	Dried Prunes	0	1		
	Dried Mixed Fruits	0	1		
	Dried Plum	0	2		
	Dried Tomato cherry	1 (10-100 ppm)	0		
	Dried Longan	0	1		
	Dried Bananas	0	1		
	Dried Raisins	1 (10-100 ppm)	0		
total		28	47	75	37.33

Discussion

Nowadays, the Thai food industry has increased the use of food additives in the manufacturing and preparation processes to get the desired characteristics or to extend the shelf life of food products. As a result, there may be an increased risk of consumer exposure to chemicals that are harmful to their health if used incorrectly or appropriately.

Sodium hydrosulfite, or bleach reagent, is one of the chemicals often added to food to help inhibit microbial growth, melanosis prevention, and also used as an anti-oxidant. However, this chemical reagent is a food allergen that can harm humans if consumed in excess. It will cause symptoms such as asthma, vitamin B1 deficiency, low blood pressure, abdominal pain and vomiting. In some cases, shock and death can occur in sensitive patients, especially asthma patients. Therefore, the objective of this research was to determine sodium hydrosulfite residue in various foods that could be

hazardous to consumer health according to Thailand's Department of Health, Ministry of Public Health's food sanitation standards (The maximum allowable dose is not more than 2000 mg/kg). Furthermore, the obtained information can be used to aid in the decision to purchase food for consumption in order to avoid allergic reactions in people who are allergic to sodium hydrosulfite.

Century eggs would often be contaminated with sulfite due to its ability to reduce the processing time while also achieving the same effect as long term preservation with baking soda, salt, and quicklime. Manufacturers prefer to use sulfites and sulfates to also reduce the production cost. Industrial copper sulfate usually contains high levels of toxic heavy metals, including arsenic, lead and cadmium, so is banned for use as a food additive. The eggs are usually preserved with baking soda, salt, and quicklime for about two months. The process turns yolks dark green and the egg white into a stiff, dark jelly. Using copper sulfate could significantly reduce the processing time while achieving the same effect.[18]

Dry products are secondly most contaminated by sulfite compounds. Since sulfite is added to dry products in order to preserve the quality of products and to increase its shelf life. Due to different laws in each country, when importing products from abroad, there may be excess sulfite content. Moreover, the addition of sulfites prolongs the shelf life and maintains the quality of the product because importing the product takes time to transport and may degrade the quality of the product.[3]

Our findings were consistent with a previous report from China[19], which examined sulfur dioxide residues in 20 different products collected from 23 different provinces in China and discovered that fresh vegetables (11.1-95.9%) and dried fruits (26.0-100%) are critical contaminated products. Furthermore, Kitcharoenwong and Uatrongchit examined sulfur dioxide in 621 samples of imported dried fruits and vegetables and revealed that sulfite contamination exceeded the limit by 34% in the samples inspected.[3]

For consumers that are concerned about eating foods contaminated with sodium hydrosulfite. There are suggestions on how to reduce the risk of ingesting sulfites from one of the properties of the sulfide group that can dissolve in water very well, especially when using heat as a stimulus and capable of spontaneously destructive redox reactions with chlorine compounds.[20] Therefore, boiling food that is thought to contain sulfide compounds and putting it in boiling water or using tap water containing chlorine compounds to wash before cooking.[20] It can remove residual sodium hydrosulfite well enough not to worry about taking too much of the chemical and causing harm to the body.[21, 22] For example, consumers should wash with clean water or blanch in boiling water for about 2 minutes before cooking. This will reduce sulfur dioxide emissions by 90%. Products designed for Dried fruits that can be eaten, such as Chinese jujube fruit, dried apricots, and dried figs. Observed from the outside, do not purchase products with color, as in the fruit drying through high heat. However, consumers who are at risk of allergic reactions to such substances should choose

food that is not contaminated with that substance. Checking the product label directly for the indication of contamination and the amount of sodium hydrosulfite in food.

On the other hand, manufacturers or importers of food additives must deliver labels to the licensor for approval before issuing labels according to the announcement of the Ministry of Public Health. In addition, relevant parties should step in and raise awareness among food producers and distributors. Including requesting the cooperation of relevant personnel to carry out inspections to improve food safety on a regular and regular basis. To reduce the risk of contaminating food additives.

Conclusion

From testing for sodium hydrosulfite contamination in five groups of ready-to-eat and ready-to-cook foods including squids, century eggs, chicken feet, dried products, and dried fruits. We can conclude that Century Eggs have the highest number of sulfite contaminated samples, whereas chicken feet are the least contaminated products. Thus consumers should avoid ingesting century eggs or if it's mandatory, it should be detoxicated before being eaten. Therefore people involved should step in and raise awareness to the food producers and suppliers. Including the cooperation from the personnels affiliated to it to investigate and improve the safety for consumption frequently to reduce the possibility of food getting contaminated by Sulfite.

Suggestion

Suggestions for research application:

Consumers at risk of sulfite allergies can use the results of this study's sulfite contamination analysis as one of the deciding factors for food purchases.

Relevant agencies should conduct surveillance for hazardous substances and food additives contaminated in food at least once a year by analysing hazardous substances and food additives according to relevant criteria.

Suggestions for future research:

Researchers should examine the sanitation of retail establishments and the contamination levels of contaminated sulfite residue in more various food samples. Furthermore, researchers should use more precise analytical methods to determine the amount of the contaminant residue.

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