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Detection of Sulfite Content in Agricultural Products Logistics Technology Research

—Taking an Example of Mushroom

Wei Wang

Beijing Wuzi University, Beijing, China
Email: wangwei199304@126.com

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Abstract

In today's real life, from the perspective of the logistics quality of agricultural products, there are many problems are paid attention by social people, such as mushroom. Mushroom products in China's exports have repeatedly been reported because of containing more sulfur dioxide in recent years. Also the dried mushroom exports were notified by nine times. Mushroom in the life is one of the people's favorite foods, so food healthy problem is to let the consumer concern it. This article explores a new method by pararosaniline hydrochloric spectrophotometry for determination of sulfur dioxide in mushroom, in the instrument detection and method research. This experiment uses the colorimetric method that is in charge of the UV spectrophotometer instrument. Finally this article puts forward the feasibility of this method. In the determination of mushrooms, laboratory reagents are used with non-toxic mercury. It reaches the national standard and it has practical feasibility.

Keywords

Quality of Agricultural Products, Mushrooms, Spectrophotometry

1. Introduction

In recent years, due to the technical level and the fact that people didn't focus on safety of agricultural food or some other factors, human didn't know the process of machine in agricultural products that added sulfur dioxide and sulfites. And they don't know how much will do harm for human health. This problem is not in-depth thinking and research. However, the food events continuously appear in people's daily life, such as clenbuterol, red duck, fake alcohol and other issues which are all harmful to human body. Also, China's theme "consumption in the sun" of the 3.15 Evening Party shows some issues that remind us that the healthy problem must be con-

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cerned. There is a widespread concern over the things that sulfur dioxide and sulfites food additive are paid more and more attention by human. The researchers are also exploring the effective methods to identify its content of food, such as sulfite class additive. If consumers eat too much food containing the additive, it must destroy the body and a large number of vitamins are lost. Once this thing is successful, it can limit the human healthy body to grow and lead to incomplete body organ. Healthy body is easy to be suffered from a large number of diseases and retained a large number of toxin in it, or be produced chronic toxic effect. Regular consumption of food is bad if foods are steamed. It not only can make people get a lot of diseases, but also can cause the whole body uncomfortable symptoms. For example, there will be a degradation of intestinal digestion and absorption function. It will damage the body's internal organs and so on. Through some information, sulfur dioxide is used in food additives which is a powerful carcinogen. Eating this kind of food can give rise to cancer. It will endanger people's body and mental heart. Due to inadequate storage, some foods appear to grow with mildew and spot bacteria. In order to make the food not waste and have got more profits, manufacturers will add this kind of additives in food. It has the effect of bleaching which can cover its virus of junk food. In the process of eating this food, consumers' health will be a serious threat. Restricted by technical conditions, it is likely to contain lead (Pb), arsenic (As) and other harmful toxins to the body health. Arsenic (As) is a well-known metal element and it is ubiquitous in real life. Arsenic compounds are determined by IRAC as a carcinoma cancer and that can make human die by causing substances. It can cause skin cancer, liver cancer, kidney cancer, bladder cancer and lung cancer and other symptoms, and also can cause the worse nervous system, urinary system, circulatory system, immune system, and will lead to diseases of the cardiovascular system. We also know that arsenic is a chronic poison, and it can harm the immune system of consumers [1]. In today's China, the sulfur dioxide is one of the most important rules to charge air pollutions. So the research of detection technology in the field of logistics food is an important significance of our life. With the permission of the national standard, people must explore suitable inspection scheme and technology that are adjust to enterprises and inspection department and it is a meaningful thing in today's life [2].

2. Limit Indicators of Sulfite

Because of the concerning things in recent years, the problems caused by growing food, so in order to prevent the maximum amount of sulfur dioxide and sulfite food additives in food exceeds the maximum added consumer acceptance of the body, so that consumers produce physical discomfort reaction, it is necessary for the maximum amount and the residual amount of sulfur dioxide and food additives like sulfites strict regulations and restrictions. At present our country's national standards GB 2760-2011, "food additives health standards" for food sixteenth to eighteen sulfur dioxide maximum use level has a very clearly defined, requiring maximum use of sulfur dioxide residues in computing, such as fresh fruits by surface treatment requires maximum use of 0.05 g/kg, juice (meat) beverages (including fermented products, etc.) requires maximum use of 0.05 g/kg, the Japanese vegetables safe maximum limit of sulfur dioxide is 30 mg/kg, Europe, Singapore, Germany and many other countries on garlic food security amount is 50 mg/kg, there are many companies with the needs of the community to develop their own food safety maximum sulfur limit of use, it is as mentioned above Like, allow sulfur dioxide food additive in food, play the role of fresh, raw food for sulfur dioxide delineated safety indicators does not exceed 100 mg/kg, for cooked food safety indicators for the demarcation of sulfur dioxide is not more than 30 mg/kg. Many of beer, wine, sulfur dioxide is often used in food additives, also its safe maximum limit of use are clearly defined, for example, manufacturers often in the red bottle body indicated ingredients containing sulfur dioxide, so the development of a realistic and reliable and accurate detection of sulfur dioxide usage, and the corresponding maximum safe limits for the use of food in promoting the modernization and internationalization has a very important significance [3].

3. Sulfur Dioxide Detection Technology

3.1. Pararosaniline Hydrochloride Method

In 1956, West made the most famous colorimetry, the basic approach is pararosaniline hydrochloride (abbreviated PRA) method, this method has been widely used in many countries and still in use today, it has become a classic method. In accordance with national guidelines in GB 5009.34-2003, "Determination of sulfite in food," food delineated content of sulfur dioxide detection means, including two ways, the first approach is commonly used pararosaniline hydrochloride method, common pararosaniline hydrochloride method includes four mercury

chloride method, formaldehyde solution absorption, triethanolamine absorption, disodium EDTA two methods, the second method is distillation, common distillation include direct titration iodimetry distillation-iodine, distillation-base titration and so on [4].

GB method delineated pararosaniline hydrochloride method is one way to test the maximum safe limit food additives commonly used, it is very simple in operation, with great sensitivity and reflect very high. However, since we all know that mercuric sodium tetrachloride pararosaniline hydrochloride method used is highly toxic nature of detecting liquid mercury enrichment capability is very durable, strong, in the course of the experiment can not be used contains solution of mercury emissions on the environment may cause serious mercury contamination, harm the natural environment, for mercury emissions from waste treatment experiments will increase a lot of manpower, material and financial resources, but also for the safety of inspectors there incalculable consequences and risks, and mercuric sodium tetrachloride-the amount of pararosaniline hydrochloride method is very large, so that the calculated process costs increased significantly, resulting in a waste of resources. Therefore, this paper, proposed a law that is mercury-free formaldehyde solution absorption method to measure sulfur dioxide in foods have more practical feasibility than the national standard method [5].

3.2. Main Instruments and Reagents

3.2.1. Instrument

1) 722N UV spectrophotometer: power, turn the power switch UV-2550, UV-Probe through computer software software enables connected, and quality inspection equipment and computers; after self-test passes, the instrument is preheated 30 minutes later, you can start the test;
2) constant temperature water bath;
3) 25 mL stoppered clean, dry cuvette;
4) ultrasound machine;
5) BT 224S analytical balance Sartorius Scientific Instruments (Beijing) Co., Ltd;

3.2.2. Reagents

In addition there are specified, the reagents were of analytical grade, water, water for the two consistent GB/T 6682 provisions;
1) Formaldehyde standard solution:
2) sulfur dioxide standard solution:
3) using the sodium sulfamate solution: a solution of 3%;
4) standard uses pararosaniline hydrochloride solution;
5) Sodium hydroxide: concentration 2 moL/L;
6) mercuric sodium tetrachloride standard solution;
7) a solution of ammonium sulfamate: 12 g/L;

3.3. Experiment Results

First, in 25 mL colorimetric tube, were added 0, 1, 2, 4, 8, 12, 16, 20 μg standard solution of sulfur dioxide, formaldehyde standard volume to absorb fluid after 10 mL were added 0.25 mL of sodium cyclamate standard solution, sodium hydroxide solution using standard 0.5 mL, 1.75 mL of hydrochloric pararosaniline standard reaction solution after use in a water bath 20˚C 20 min, remove the stability was measured after 10 min, with clean than 1 cm cuvette with zero tube to find the optimum zero after measuring the absorbance value at a wavelength of 580 nm at the stars and sulfur dioxide standard solution absorbance showed a good linear relationship, the regression equation $y = 0.0326x + 0.2528$, the correlation coefficient to $R^2 = 0.9995$, so it can be used as an identification standard curve mushrooms sulfur dioxide content.

Second, the record five absorbance values colorimetric tube, measuring results, see **Table 1** results: we can see that the maximum absorption peak at a wavelength of 580 nm at, so, to sum up, results for the selected 580 nm in this study, the optimal wavelength, that is when the UV spectrophotometer used to take samples to determine the absorbance at 580 nm.

During the experiment, due to the use of sulfur dioxide standard sample solution will be added with the formaldehyde standard solution to generate very stable hydroxy methyl sulfonic acid, and stable hydroxymethyl and hydrochloric acid will pararosaniline solution is inserted sodium hydroxide produced under conditions inevitable purple compound, to produce the compound that is required in this specific alkaline conditions, so the

experiment must be played on the creation of basic conditions of optimum usage explore. With the use of sodium hydroxide solution used to increase the amount of volume, maximum absorption wavelength makes regular to shorter wavelength directional movement that makes maximum absorption wavelength occurred quite obvious blue shift, the results can be seen in **Figure 1** is blue shift phenomenon:

Finally, take 10 different mushroom products, repeat the above steps in the sample were added to spiked amount 4 μg of, and for sample at the same time measurements, the experimental data obtained shown in **Table 2** and **Table 3**, and at the same time mushroom samples were detected sulfur dioxide to meet the basic requirements of the experiment:

Four kinds of mushrooms in the detection of residues containing sulfur dioxide in China is in line with national standards, namely ≤50 mg/kg. Description mushrooms sulfur dioxide is by the use of the experiment can be detected by this method.

4. Conclusion

Agricultural products of lentinus edodes are one of the most favorite foods in people's daily life. If enterprises want to let consumers eat food happily, the sulfur dioxide in agricultural products should be limited and not

Table 1. Wavelength original records.

Wavelength nm	500	510	520	530	540	550	560	570	580	590	600
Absorbance	0.174	0.196	0.226	0.267	0.315	0.358	0.383	0.402	0.404	0.354	0.263

Table 2. Mushrooms spiked determination.

Mushrooms Sample	Background values (μg/mL)	Plus scalar (μg/mL)	measured value (μg/mL)	Recovery rate (%)
1	5.15	4.0	8.87	96.94
2	4.98	4.0	9.03	100.56
3	5.62	4.0	9.01	93.66
4	5.43	4.0	8.99	95.33
5	5.57	4.0	9.37	97.91
6	5.90	4.0	9.76	98.59
7	5.09	4.0	8.81	96.92
8	5.44	4.0	8.91	94.39
9	5.25	4.0	9.15	98.92
10	5.84	4.0	8.95	90.96

Table 3. Mushrooms sulfur dioxide content of the sample.

Mushrooms sample	Mushrooms weigh quality (g)	SO_2 present in an amount (μg)	Results (mg/kg)	Mean (mg/kg)
1	5.15	1.6130	31.32	
2	5.08	1.5982	31.46	31.39
3	5.23	2.1155	40.45	40.23
4	5.55	2.2206	40.01	
5	5.46	1.3836	25.34	
6	5.09	1.3239	26.01	25.68
7	5.18	0.8697	16.79	
8	5.24	0.8725	16.65	16.72

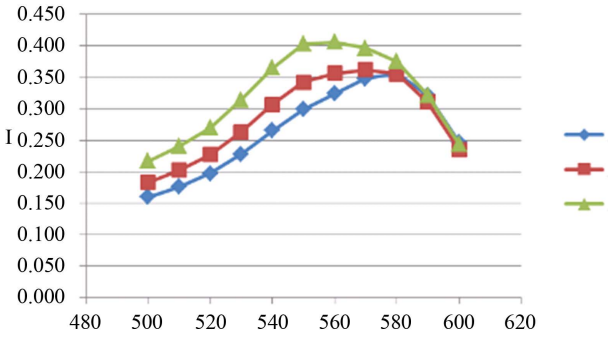

Figure 1. The blue shift phenomenon.

exceed the biggest safety use of food additives. The detection skills are also necessary. China should strengthen their inspection theory, inspection technology, personnel training and so on. It can't be returned again that products are sold to foreign countries because of overtaking levels of problem. China should improve the circulation of agricultural products in the research of determination method of sulfur dioxide in food additives, establish formally, qualified and standardized system and reach the level of the world's leader's test method for sulfur dioxide. China should explore the technique of detecting food additives, and do save resources and protect the natural environment. The purpose of the use of additives is to ensure food safety. Finally, we must protect the rights and interests of consumers and their health. Let consumers know that sulfur dioxide containing in agricultural products is harmful to human body and know the detection method of additives in the life. We need to build better methods of detecting food additives to adapt to the rapid development in today's society.

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