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The Analysis and Testing on the Relationship between Food Packages and Food Quality Guarantee Period

Abstract: the most important function of the packages is to guarantee the quality of the food during quality guarantee period. However, there has been no standard and regulations on how to select food packaging materials and what the requirements are. This article, on the aspect of the key factors influencing food safety, discusses on the relationship between food packages and food quality guarantee period.

Key Words: quality guarantee period, transmission rate, food, microorganism, sodas

Food safety has become the focus recently. With the consecutive exposure of re-packed milk, food deterioration during quality guarantee period and random production date mark for bulk goods, food quality guarantee period issue has become a focus of the mass. This article will discuss the relationship between food packages and food quality guarantee period from the key factors affecting food safety.

1. Food Quality Guarantee Period

At present, most food quality guarantee period are regulated by the manufacturers themselves since there is no national compulsory regulation. Owing to the lack of technologies and instruments, some manufacturers decide quality guarantee period on their experiences and estimation. Even for most of the manufacturers, how to rationally determine the food storage period and quality guarantee period is a technical problem.

Physical & chemical indexes, hygiene indexes and sensory indexes are the three main aspects evaluating food deterioration. Physical & chemical indexes regulate the ingredients and their quantity; hygiene indexes are for the measurement of the contaminating degree of the food by microorganism or other substances; and sensory indexes are the evidences for food quality and taste judgments. The evidences vary for different kinds of food. For example, ingredients are emphasized for nutrients; and tastes for specialties.

In 2006, National Light Industry Council stipulated the quality guarantee periods of 9 kinds. However, this stipulation is not so practical. For example, the quality guarantee period for PET sodas is 12 months unexceptionally, and two times the stipulated one. The food industry standards and national standards also lack of the judging methods for food quality guarantee periods, though the term food quality guarantee period is mentioned in the earlier editions of some standards. For example, GB/T 10792-1995 Carbonated Drinks (Soda Water) is also of poor instructiveness, and was deleted in the newest 2008 edition.

Now, there exist three problems concerning food quality guarantee period: first, how to determine food quality period. The measurement through accelerating test can not be afforded by mediate and small-sized manufacturers for the testing costs and testing period. Furthermore, there is no uniform testing method. Second, the difference between quality guarantee period and preservation period. Quality guarantee period is the promise made by the manufacturer to confirm best food quality within the marked period, and the food is still edible after quality guarantee period if the appearances and smell have not yet changed. Preservation period indicates the deadline to eat the food preserved under the guiding conditions. And if expires this period, the food will go bad. Those who mark preservation periods are scarce. What we cares emphatically is not the best quality performance during preservation period, but deterioration of the food. Third, the appearance of new packaging materials and their applications. Take milk powder for example, National Light Industry Council stipulated the quality guarantee period for tinned pail is above 12 months, and plastic pouches 3 months. Actually, milk powder in pouch packages is usually with a quality guarantee period of more than 6 months. However, owing to the

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variety of plastics, the quality guarantee period of PE material lasts less than a month and the aluminum-plastic composite pouch can prolong the period to 1 year.

2. The Relationship between Flexible Package and Quality Guarantee Period

2.1 The Main Causes for Food Deterioration

As to most of the food, the deterioration is mainly caused by the growth of microorganism. The food processing procedures, including washing, sterilization, baking and frying, can greatly decrease the type and number of microorganisms in the food, or even kill them all. But, the microorganism residual rate can be affected by the factors such as raw material physical and chemical condition, processing and the difference in raw material microorganism contamination degree. Besides, during the processing, transportation and storage, the processed food can be re contaminated by the microorganisms. The microorganism residual in the processed food and the newly contaminated microorganism will reproduce at the explosive rate, and result in deterioration.

Temperature, gas and humidity, etc. are closely related to the growth and reproduction of the microorganism in the food. In actual preservation, temperature and humidity of food can be controlled at a low cost. However, the ambient gas content control is quite difficult. Adequate oxygen around will encourage the growth of aerobes. Since the growth rate of aerobes and the corresponding food deterioration rate are much faster than those of anaerobes, oxygen is regarded as one of the important factor causing food deterioration.

2.2 The Analysis on Causes of Food Deterioration within Quality Guarantee Period

Not only the small-sized manufacturers grossly estimate the quality guarantee period which is of nearly no value, some big manufacturers, even famous brand manufacturers have to face the news of their deteriorated products within quality guarantee period frequently. The deterioration of food during quality guarantee period will lead to serious results. Yet, most manufacturers attribute such kind of deterioration to leakage caused by improper operation during transportation and storage. Owing to the lack of authoritative testing, these deterioration accidents would always end unsettled. Thus, it can not be confirmed whether the deterioration is caused by the above-mentioned leakage. If the packages of those deteriorated food are intact, and the food meets the processing requirements completely before packaging, then, the cause may lies in package design, or even material selection.

2.3 The Related Testing of Material Permeability and Food Quality Guarantee Period

Through the above analysis, there is close relationship between the whole package oxygen transmission rate and the quality guarantee period. If the packaging material is of inferior barrier property, the possibility of food deterioration caused by ecstasy microorganism growth with inlet oxygen will be greatly increased. Yet, the better barrier property of the packaging material, the more costs for packaging. Therefore, it is of great significance to start research on relationship between packaging material barrier property and food quality guarantee period.

Labthink Lab has started research and testing on this subject: Labthink has purchased a great lot of food specimens in their quality guarantee period and in intact packaging status. Then, the oxygen transmission rates of their packaging materials are tested so as to comprehensively analyze the relationship between whole package oxygen transmission rate and the printing quality guarantee period. At present, the testing specimens include varied plastic bottles with carbonated drinks, milk beverage and edible oil.

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The testing data for bottles of carbonated drinks are as follows:

Company	Brand	600ml	1250ml	2000ml	2500ml
A	A1	0.2755		0.4799	0.6193
	A2	0.2954	0.4018	0.4707	0.5805
	A4	0.2694	0.3854		0.5760
B	B1		0.4252	0.4779	0.5120
	B2		0.4151		
	B3				0.5327

Unit：ml/pkg•day。

Each value of the above data sheet is the average value of 3 specimens. The data will be further completed that can help us learn the law. For example, changing the data into the contact oxygen quantity of 1ml beverage, then, the smaller the bottle volume, the more contact oxygen quantity of 1ml beverage. Of course, the consumption rate should be taken into consideration when selecting material and designing packages. Furthermore, the oxygen sensibility of the product ingredients should also be noted.

3. Conclusions

The growth of microorganism is the main factor of food deterioration, and the existence of oxygen is the important factor of microorganism growth. Therefore, the barrier property of food packages against oxygen is quite important. Labthink Lab holds that there is close relationship between whole package oxygen transmission rate and quality guarantee period, and therefore, makes great quantities of tests for data analysis. At the same time, those data is the important evidences for food packaging standard drafting as well as packaging style and material selection.