Study on the Protective Difference between Fresh-keeping Packaging and Conventional Packaging in the Production of Yellow Spot Cigarettes

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Abstract. In the process of unpacking cigarette packaging consumption, packaging materials and packaging design have an important impact on cigarette quality. Effects of fresh-keeping packaging on water retention performance, sensory quality and risk control of yellow spot cigarettes were studied in this paper. The results show that the stability of sensory quality of fresh-keeping packaging is better than that of conventional packaging. The differences of packaging type, material and technology will lead to the differences of water retention performance, but the differences are not obvious. Compared with the conventional packaging, the fresh-keeping packaging can effectively reduce the risk of yellow spot cigarettes and realize the risk control.

1. Introduction

In order to effectively avoid the excessive fluctuation of moisture content of cigarette products in the process of consumer's consumption after unpacking, the new technology of "fresh-keeping" small box packaging of cigarette, which uses physical method to keep moist and changes the traditional packaging mode of cigarette, has been paid attention to and gradually applied\cite{1-3}. Cigarette "fresh-keeping" small box packaging is also known as sealed packaging, moistening packaging, water retaining packaging, water locking packaging, fragrance preserving packaging, etc. the closed packaging space is formed by aluminum plastic barrier and paper aluminum plastic barrier in the form of heat seal or adhesive, combined with the repeatedly opened and sealed cigarette, which has good water and fragrance preserving function\cite{4-8}. It first appeared in British American Tobacco Company and in Dunhill and 555 brands. The specifications were applied. Subsequently, some tobacco companies also carried out the application of "fresh-keeping" packaging in Marlboro brand specifications. Recently, the "fresh-keeping" packaging has been gradually introduced or independently developed and applied in some domestic cigarette specifications. Because the "fresh-keeping" package can be opened and kept sealed repeatedly after the cigarette box is opened, the purpose of keeping the cigarette products moist and fragrant is achieved through physical methods, so it has a good application prospect.

At present, the "fresh-keeping" packaging is gradually applied to cigarette products at home and abroad. However, there is no report on the water retention performance of cigarette products by various
"fresh-keeping" packaging methods and technologies. In this study, different "fresh-keeping" packaging and ordinary conventional packaging were compared, and the differences of water retention performance, sensory quality and risk control of yellow spot were systematically studied, which laid a theoretical foundation for further development, application and upgrading of "fresh-keeping" packaging technology.

2. Experimental

2.1 Materials
At present, the common "fresh-keeping" packaging has different ways in the form of appearance packaging, as shown in Fig.1, including soft box, hard box, manual box up turn, side turn and other conventional and special-shaped packaging, and the opening way has once and twice opening.

![Fig.1 Schematic drawings of several common cigarette freshness-keeping packaging(soft, hard, full-open fresh-keeping packages)](image)

2.2 Difference of water retention performance between fresh-keeping packaging and conventional packaging and its effect on sensory quality
Seal the test sample in the simulated open test box with good balance adjustment in the standard environment (22 ℃, 60% RH), high temperature and high humidity environment (35 ℃, 80% RH), high temperature and low humidity environment (35 ℃, 30% RH), low temperature and low humidity environment (10 ℃, 30% RH), low temperature and high humidity environment (10 ℃, 80% RH) specified in GB / T 16447-2004, and take out the cigarette samples for inspection at 24 h and 48 h respectively. The change of water content was measured. Select the cigarette samples with obvious difference in moisture content, organize score and describe the sensory evaluation of cigarette samples according to the sensory technical requirements of cigarettes.

2.3 Protection difference between fresh-keeping packaging and conventional packaging for producing yellow spot cigarettes
The simulated open package test samples with good balance adjustment were sealed in the standard environment (22 ℃, 60% RH) and high temperature and high humidity environment (35 ℃, 80% RH) specified in GB / T 16447-2004. The cigarette samples were taken out for 1 d, 2 d, 3 d and 4 d respectively by visual inspection method. The yellow spots on the cigarette surface were identified as yellow spots. The cigarette samples were collected and counted as the occurrence of macular smoke.

3. Results & Discussion

3.1 Effects of fresh-keeping packaging and conventional packaging on sensory quality
After 48 h of test cycle, the 1-1# and 1-2# common packages with good water retention performance and large change range of moisture content of the fresh-keeping package, and the 1-7 # and 1-8# common packages with the largest change range of moisture content of the full open package, the cigarette samples under the corresponding two test environments, and the control cigarette samples of the same batch (directly unsealed and unbalanced), were selected for sensory quality evaluation according to the GB 5606-4 standard, as shown in Table 1 the evaluation results. It can be seen that the score of fresh-keeping packaging test cigarette sample is higher than that of the control, and the score of general
packaging test cigarette sample is lower than that of the control. According to the description of smoking evaluation, the main reason why the score of fresh-keeping package cigarette sample is higher than that of the control is that the smoke is less irritant, the comfort and softness are better. The reason may be that the water content of the control water content production standard is lower than that of the fresh-keeping package cigarette sample after balance. The expression of low score of cigarette samples in high temperature and humidity environment of ordinary packaging is that the fragrance of cigarette is insufficient and the fullness of cigarette is not enough, while the low score of cigarette samples in high temperature and drying environment is due to the drying, stimulation and comfort of cigarette smoke. According to the sensory evaluation, under the condition of environmental difference, compared with the sensory quality fluctuation of conventional packaging cigarettes, fresh-keeping packaging can effectively keep the sensory quality of cigarette products stable after unpacking.

Table 1 Statistical table of sensory quality evaluation scores of cigarette samples in the simulated opening test of fresh-keeping packaging and conventional packaging

| Sensory evaluators Nos. | Sensory scores (full marks 100) | 35 °C, 80 %RH | 35 °C, 30 %RH |
|-------------------------|---------------------------------|---------------|---------------|
|                         | 1-1 1-2 1-7 1-8                 | 1-1 1-2 1-7 1-8 |
| 1                       | 91.5 92.5 90.5 92.5            | 90.0 91.0 90.0 91.5 |
| 2                       | 91.5 93.5 90.0 93.0            | 90.0 91.5 90.5 91.5 |
| 3                       | 91.0 93.0 90.0 92.0            | 90.0 92.0 89.5 92.5 |
| 4                       | 91.5 91.5 90.5 91.5            | 90.5 91.5 90.5 91.5 |
| 5                       | 91.5 92.0 91.0 91.5            | 90.0 93.0 90.0 92.5 |
| 6                       | 91.5 92.5 90.5 92.5            | 90.5 92.5 90.0 92.5 |
| 7                       | 91.5 92.0 90.0 91.5            | 90.0 91.5 89.5 91.5 |
| Average                 | 91.43 92.43 90.36 92.07        | 90.14 91.86 90.00 91.93 |
|                         |                                 | 89.79 89.79 89.79 89.79 |

3.2 Different effects of fresh-keeping packaging and conventional packaging on the production of yellow spot cigarettes

Select soft package, hard package, full open conventional small box package and corresponding fresh-keeping package, simulate the test sample of open small box and put it under the environment of high temperature and high humidity after balancing, take out 5 parallel cigarette samples (90 cigarettes) from each test cycle, and make statistics on the production of yellow spot tobacco. The results are shown in Table 2.

Table 2 Statistical table of the production of macular cigarettes in the test environment and cycle of each package cigarette sample

| Array | Sample No. | 22 °C, 60 %RH | 35 °C, 80 %RH |
|-------|------------|---------------|---------------|
|       | 1 d 2 d 3 d 4 d 1 d 2 d 3 d 4 d | 1 d 2 d 3 d 4 d |
| 4-1   | 0 0 0 0     | 0 0 0 0   | 2 1 1 1     |
| 4-1-1 | 0 0 0 0     | 0 0 0 0   | 0 0 0 0   |
| 4-1-2 | 0 0 0 0     | 0 0 0 0   | 0 0 0 0   |
| 4-1-3 | 0 0 0 0     | 0 0 0 0   | 0 0 0 0   |
| 4-1-4 | 0 0 0 0     | 0 0 0 0   | 0 0 0 0   |
| 4-1-5 | 0 0 0 0     | 0 0 0 0   | 0 0 0 0   |
| Total | 0 0 0 0     | 0 0 0 0   | 1 1 1 1   |
| 4-2   | 0 0 0 0     | 0 0 0 0   | 4 6 9 7   |
| 4-2-1 | 0 0 0 0     | 0 0 0 0   | 1 1 1 1   |
| 4-2-2 | 0 0 0 0     | 0 0 0 0   | 4 6 9 7   |
| 4-2-3 | 0 0 0 0     | 0 0 0 0   | 1 1 1 1   |
| 4-2-4 | 0 0 0 0     | 0 0 0 0   | 1 1 1 1   |

3
It can be seen that under the condition of control equilibrium, only one yellow spot cigarette was found in the samples of hard pack conventional pack and full open conventional pack respectively, and no yellow spot appeared in the samples of fresh pack cigarettes. In the environment of high temperature and high humidity, with the extension of test period, the number of yellow spot cigarettes in each package increased, especially after 3-4 days. The number of yellow spot cigarettes in the conventional package was significantly higher than that in the fresh-keeping package. In the conventional package, the number of yellow spot cigarettes in the full open package was the most, significantly higher than that in the soft and hard package. The number of yellow spot cigarettes in the soft and hard package was similar, and the full open package was fresh-keeping The number of yellow spot produced by packaging was slightly higher than that of the two. It is analyzed that the reason for the largest number of yellow spot cigarettes is that the open and close area of the full open packaging seal is larger, and the environmental factors are more likely to affect the change of moisture content of the internal cigarettes.

### 4. Conclusion

By comparing the effects of different packaging materials and packaging methods on the quality of cigarettes, the results show that: (1) after the opening of cigarette packaging, fresh-keeping packaging can effectively keep the moisture content of cigarettes stable, while the moisture content of cigarettes in conventional packaging will change in a large range with time and environment (except for balance conditions). Because of the difference in water retention, the stability of the sensory quality of fresh-keeping packaging is better than that of conventional packaging. (2) compared with conventional packaging, fresh-keeping packaging can effectively reduce the risk of yellow spot cigarette and realize risk control.
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