

Effects of Different Packaging Materials on Storage Quality of Crisp Plum

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Abstract. This experiment uses "Bashan crisp plum" as the material, uses nano-bags and spontaneous modified atmosphere preservation bags for packaging, combined with 1-MCP fumigation treatment, and stores in a cold storage at $1\pm 1.5^{\circ}\text{C}$. The physiological and biochemical measurements are measured every 15 days. Indicators to discuss the low-temperature storage effects of different packaging materials. The results showed that the use of nano-bags and air-permeability of 3000mL/bag/24h modified atmosphere packaging can reduce fruit rot, delay the yellowing of the peel, better maintain the fruit texture and organic acid content, and better maintain the original fruit.

1 Introduction

"Bashan crisp plum" is an excellent variety formed through directional cultivation in the long-term production practice of planting plums. It passed the Sichuan Crop Variety Certification in December 2011. It has a crisp, sweet taste, high soluble solid content, and flavor. Unique and other advantages^[1], it has become the second major fruit grown in Dazhou City, and has gradually developed into a new growth point for rural support industries and rural economy in Xuanhan County, Dazhou City. However, with the increase in output and area, part of the fruit will be stored in order to avoid concentrated listing on the one hand and to increase the added value of the industrial economy on the other hand. However, there are still few studies on the postharvest storage technology of Bashan crisp plum.

1-MCP and spontaneous modified atmosphere packaging are currently commonly used commercial fresh-keeping technologies for fruits and vegetables, which can better maintain the commercial quality of fruits and effectively extend the storage period^[2-4]. However, there is still no relevant report on the suitable plastic wrap treatment technology for Bashan crisp plum. This study intends to analyze and compare the effects of different packaging materials combined with 1-MCP slow-release agent treatment on the quality of postharvest fruits, and initially screen out the best preservation film suitable for storage of Bashan crisp plums, which is a necessary theory for effectively prolonging the storage period of fruits and technical support.

2 Materials and methods

2.1 materials and processing

The samples for this experiment were collected in Huaguo Mountain, Miao'an Township, Tongchuan District, Dazhou City. The samples are required to have uniform color and size, consistent maturity, no disease and no mechanical damage. They are transported back to the Dazhou Academy of Agricultural Sciences after harvest on the same day and immediately precooled to dissipate field heat. After the pre-cooling is completed, three packaging materials are used for processing, namely nano fresh-keeping bags and modified atmosphere fresh-keeping bags (air permeability 3000mL/bag/24h, air permeability 20000mL/bag/24h). Each packaging bag contains about 5kg of green crispy plums and counts them separately. Each treatment is stored in a freezer at $1\pm 1.5^{\circ}\text{C}$, the packaging bag is not tied, and the 1-MCP is used for fumigation for 8-12 hours. Each treatment was repeated 3 times, and samples were taken every 15 days to investigate the fruit rot rate and quality changes.

2.2 measurement indicators and methods

Decay rate. The fruit surface is softened, dented and shrunk, the fruit surface is water-soaked plaques, fluid, mold, rot and other phenomena are used as the basis for judging rot. Pick out the rotten fruits and count them, and calculate the formula: rotten rate = (number of rotten fruits/total number of fruits) \times 100%.

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Peel color. A 3nh precision colorimeter was used to measure two symmetrical points at the equator of the fruit, where the L^* value represents the change in the brightness of the fruit from bright ($L^*=100$) to black ($L^*=0$). The a^* value represents the color change from green ($-a^*$) to red ($+a^*$). The larger the absolute value, the heavier the corresponding green and red. The b^* value represents the change between yellow and blue. The h° value indicates the color angle, where 0° indicates red-purple, 90° indicates yellow, 180° indicates blue-green, and 270° indicates blue.

Hardness, soluble solids, acidity. The hardness is measured by the GY-1 fruit hardness meter at the symmetrical two-point peeling hardness of the fruit at the equator; the soluble solids are measured by a hand-held brix meter; the acidity is measured by the acidity meter.

2.3 Data processing

Use Excel 2007 for data statistics and graphing.

3 Results and analysis

3.1 The influence of different packaging materials on the rot rate of green crisp plum

Due to the high water content of the green crisp plum fruit, coupled with the continuous decline in resistance during storage, the fruit is susceptible to mold infection and rot, causing the rot rate to continue to rise. The effect of different packaging materials on the rot rate of green crisp plums is shown in Figure 1. It can be seen from Figure 1 that when stored for 15 days, the green crisp plums of each treatment group began to rot. Due to condensation in the modified atmosphere preservation bag, the decay rate was higher than that of the nano bag packaging. The decay rate of green crisp plums increases with the extension of storage time. During the same storage period, the decay rate of the fruits packaged in a modified atmosphere bag with an air permeability of 20000mL/bag/24h is higher than that with an air permeability of 3000mL/bag/24h. There is no significant difference in the decay rate of the air permeability of 3000mL/bag/24h and the nanobag. When stored for 60 days, the decay rate of the modified atmosphere fresh-keeping bag with an air permeability of 20000mL/bag/24h increased significantly by up to 5.63%, which was 2.73% higher than that of the fruit packaged in nano-bags.

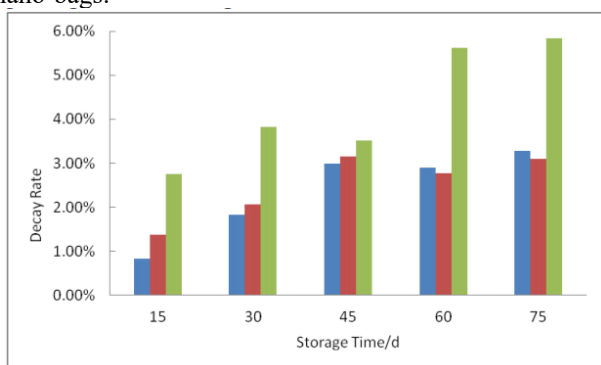
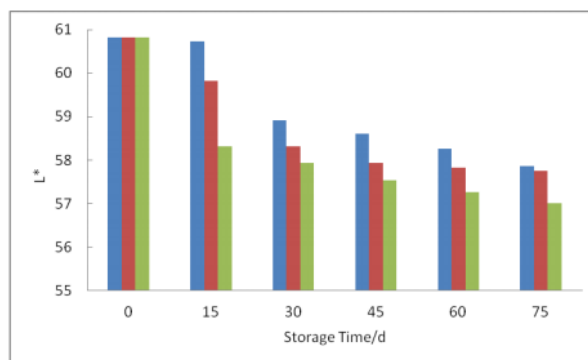


Fig. 1. The influence of different packaging materials on the rot rate of green crisp plum

(Note: In the figure, blue represents nano-bag packaging, red represents a modified atmosphere storage bag with an air permeability of 3000mL/bag/24h, and green represents a modified atmosphere storage bag with an air permeability of 20000mL/bag/24h, the same below.)

3.2 The effect of different packaging materials on the color of green crisp plum peel

The effect of different packaging materials on the color of green crisp plum peel is shown in Figure 2. It can be seen from Figure 2 that with the extension of storage time, the brightness (L^* value) of all processed fruits gradually decreased. At 15 days, the air permeability of the air-conditioning bag with an air permeability of 20000mL/bag/24h decreased rapidly, and then decreased slowly. This is due to the fact that there are more water droplets in the air-conditioned fresh-keeping bag with an air permeability of 20000mL/bag/24h when the green crispy plum is stored for 15 days after processing. The a^* value represents the color change from green ($-a^*$) to red ($+a^*$). The larger the absolute value, the heavier the corresponding green and red. It can be seen from the figure that the absolute value of a^* keeps decreasing during the storage of green crispy plums, indicating that green crispy plums gradually lose their original green color. Green crispy plums are packaged in nano-bags and air-permeability modified atmosphere bags with 3000mL/bag/24h. When the difference in a^* value is small. The b^* value represents the change between yellow and blue. It can be seen from the figure that the green crisp plum gradually turns yellow during storage. From the analysis of the test data, the nano bag and the air-permeability of 3000mL/bag/24h can maintain the stability of the peel color better than that of the air-permeability of 20000mL/bag/24h.



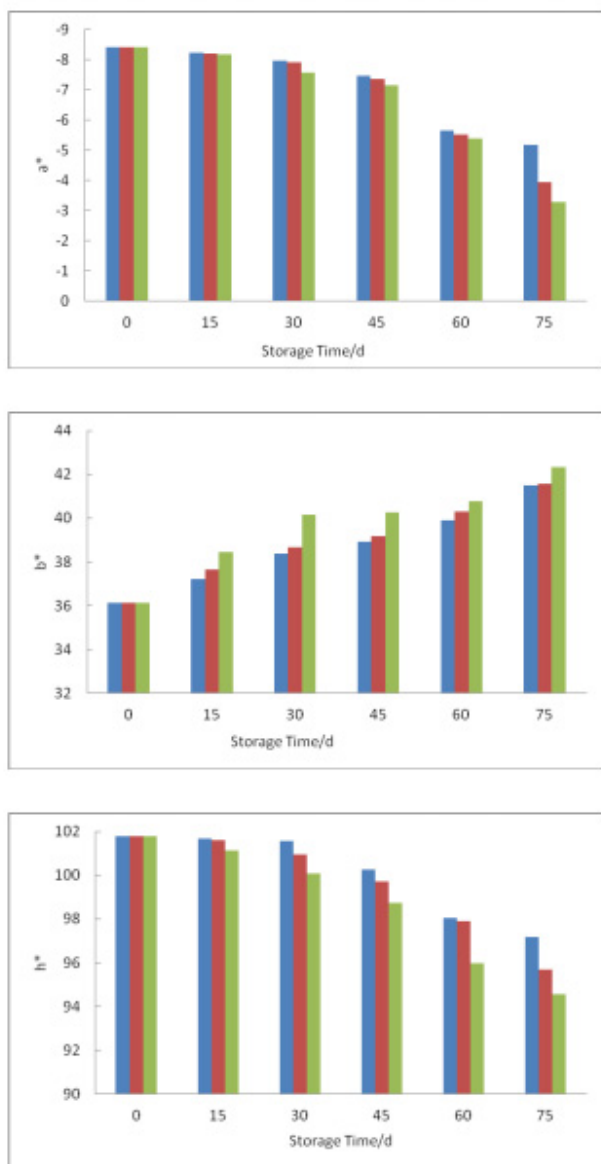


Fig. 2. The effect of different packaging materials on the color of green crisp plum peel

3.3 The influence of different packaging materials on the hardness, soluble solids and acidity of green brittle plum

The influence of different packaging materials on the hardness, soluble solids and acidity of green brittle plums is shown in Figure 3. It can be seen from Figure 3 that with the extension of the storage period, the hardness and soluble solid content of green brittle plums gradually decrease, and the acidity gradually increases. However, whether it is hardness, soluble solids or acidity, the air permeability of 20000mL/bag/24h is compared with nanobags and the air permeability of 3000mL/bag/24h. The changes are faster. At the same time, there is little difference between the nano bag and the modified atmosphere bag with an air permeability of 3000mL/bag/24h.

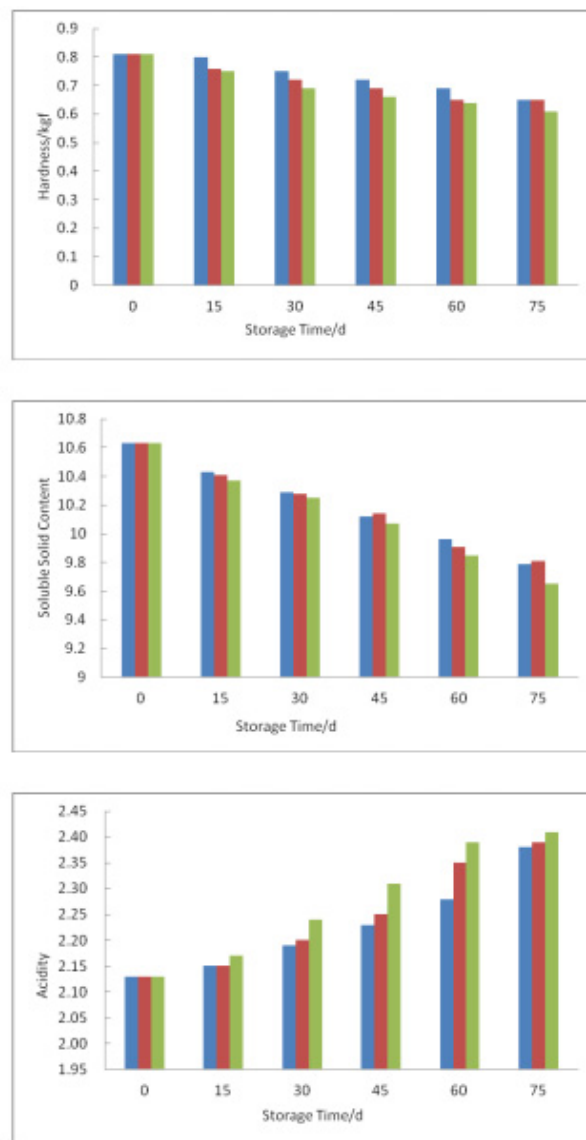


Fig. 3. The effect of different packaging materials on the hardness, soluble solids and acidity of green brittle plum

4 Summary and discussion

The harvested fruits and vegetables are still undergoing physiological activities such as breathing. Maintaining proper O₂, CO₂, water vapor and other gas content in the packaging bag can slow down the ripening and corruption of fruits and vegetables. When the O₂ content in the packaging bag is less than 3% or the CO₂ content is greater than 10%, the fruits and vegetables will undergo anaerobic respiration and produce volatile substances such as ethanol and acetaldehyde, causing anaerobic oxygen damage and peculiar smell. The spontaneous modified atmosphere packaging is a simple modified atmosphere storage method commonly used in commerce. It uses the fruit's own respiration metabolism to reduce the oxygen concentration in the packaging bag and increase the carbon dioxide concentration, thereby further inhibiting the physiological metabolism of the fruit and delaying the fruit. Aging^[5].

As an ethylene antagonist, 1-MCP plays an important

role in the preservation of many horticultural products^[6]. This experiment analyzes and compares the effects of different plastic wraps on the postharvest storage quality of green crispy plums, screens the best wraps suitable for crispy plums, combines the early 1-MCP fumigation and low temperature treatment, and initially proposes the best postharvest green crispy plums Storage and preservation technology, improve preservation effect and prolong storage period. The results showed that the use of nano-bags and air-permeability of 3000mL/bag/24h modified atmosphere packaging can reduce fruit rot, delay the yellowing of the peel, better maintain the fruit texture and organic acid content, and better maintain the original fruit. Have flavor. In summary, when green crisp plums are stored at low temperature after harvest, they can be packaged in nano-bags or modified atmosphere fresh-keeping bags with an air permeability of 3000mL/bag/24h, combined with 1-MCP fumigation treatment.

References

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