

# The Effect of Different Bags on Chlorophyll and Carotenoids in the Peel of Chinghuang Mango

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**Abstract.** The effect of different fruit bags on the content of chlorophyll and carotenoids in the fruit peel of Chinghuang mango during normal storage and after-ripening process was studied. The results showed that the content of chlorophyll and carotenoid in the bag was significantly lower than that of the control fruit. The skin color of the white paper bag fruit and the no bagged bag fruit was green during the green ripening process, while the outer yellow inner black paper bag fruit showed a yellow green halo. When ripe, the control fruit is yellowish green and orange red. The white paper bag fruit is greenish orange yellow, and the outside yellow inside black composite paper bag fruit is golden yellow.

## 1 EXPERIMENTAL MATERIALS AND METHODS

### 1.1 Experimental Materials, Instruments and Reagents

#### 1.1.1 Experimental Materials

The experiment was carried out at the demonstration orchard of tiandong Mango of CAAS in 2017. The test species was Chinghuang Mango. There are 3 bagging treatments. A is treated as white paper bag; B processing is the outer yellow inner black composite paper bag; CK is the control, not bagging, all the specifications are 23cm x 36cm. The bags are all provided by fruit bag factory of the CAAS. The bagging time was carried out after the second times of physiological fruit drop (April 20th). Before the bagging, the whole fruit was set and fixed, Spray pesticides and nutrient solutions, then the bag was single bagged. Each treatment was treated with 5 repetitions, which were Randomly arranged, and the bag was removed when harvesting. Take out 20 fruits per treatment and placed indoors, Let the fruit mature naturally. The representative fruit samples were quickly separated the peel from (about 0.8 ~ 1 mm) the pulp by a scalpel at the same time and frozen in liquid nitrogen. The content of chlorophyll and carotenoid in fruit peel was measured every two days for a total of five measurements.

#### 1.1.2 Instruments and Reagents

UV-Vis Spectrophotometer (Shimadzu UV-2700), Balance (Mettler Toly Electronic Balance AB204-S\A).

Extract: acetone 80 mL and plus distilled water to 100 mL.

### 1.2 Sample Preparation Method

Accurately weigh 0.50 g representative skin samples in a mortar, A few quartz sand and CaCO<sub>3</sub> and 3 mL extracts were lapping evenly and transferred into the 50 mL bottle, and the mortar was washed into the capacity bottle and fixed all by the extractant. The dark condition was extracted at room temperature for 24 h, and the supernatant was used for analysis.

### 1.3 Instrument Analysis Methods

The absorbance of the sample solution was measured respectively at 665 nm, 649 nm, and 470 nm.

Calculate the concentration of chlorophyll a and b, carotenoids according to the formula:

Chlorophyll a concentration:  $C_a = 13.95 \times A_{665} - 6.88 \times A_{649}$ , unit mg/L;

Chlorophyll b concentration:  $C_b = 24.96 \times A_{649} - 7.32 \times A_{665}$ , unit mg/L;

Carotenoid concentration:  $C_{x.c} = (1000 \times A_{470} - 2.05 \times C_a - 114.8 \times C_b) / 245$  unit mg/L.

The content of each pigment component in the sample is calculated based on the concentration of each pigment:  $X = C \times V \times B / 1000 / M$

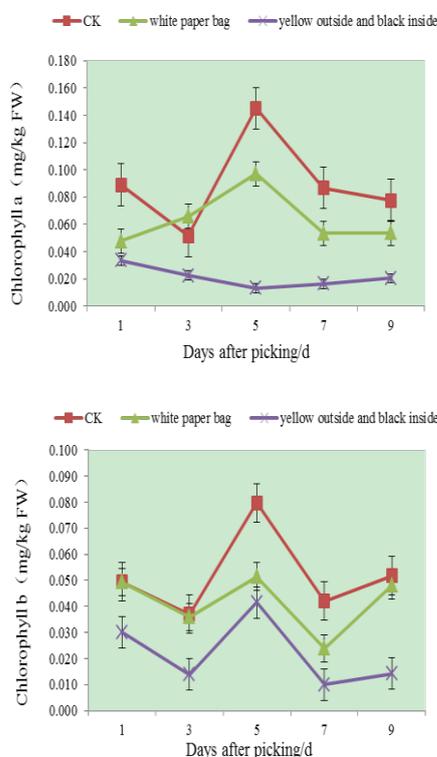
X—the content of each pigment, mg/g; C—the concentration of each pigment, mg/L; V—the volume of the extract, mL; B—the multiple of the supernatant when analyzed (as the case may be); M—sample quality, g.

## 2 RESULTS AND ANALYSIS

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## 2.1 Effect of Different Fruit Bags on Chlorophyll Content in Peel of Chinghuang Mango

After the Chinghuang mango was picked and unbagged, the content of chlorophyll a in the control group was reduced first, and then reached the highest level by the 5th day (Figure 1), and then decreased. The content of chlorophyll a in the peel of white single layer paper bags increased continuously until the fruit ripening, and then decreased. The content of chlorophyll a in the outer yellow and black composite paper bag was decreased first, and reached the minimum at fifth days and then slightly increased. The content of chlorophyll a in the pouch fruit peel was higher than that of white single paper bag, and that was the lowest in the outer yellow inner black paper bag fruit in the different bagging treatment.



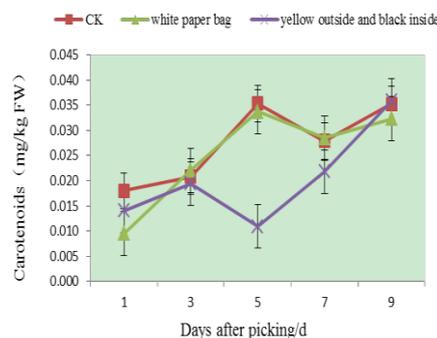
**Fig. 1.** Effect of Different Fruit Bags on chlorophyll Content in Peel of Chinghuang Mango in the process of aging

The overall trend of chlorophyll b content is reduced first and then reached the highest when it reached fifth days after Chinghuang mango was picked and unbagged. It fell to a minimum on the seventh days and increased slightly by the ninth day (Figure 1). After reaching the ripeness of the bagging treatment, the content of chlorophyll b in the control peel was higher than white single-layer paper bag, which was the lowest in outer yellow black composite paper bag.

## 2.2 Effect of Different Fruit Bags on Carotenoid Content in Peel of Chinghuang Mango

The overall trend of carotenoid content in control and white single-layer paper bags was consistent after the Chinghuang mango was picked and unbagged. It first rose to the maximum on the fifth day of ripening, and

then decreased slightly on the next seventh days and slightly increased on the ninth day. However, the content of carotenoids in the peels of the outer yellow inner black composite paper bag increased first, and then reached the lowest level on the fifth day, then reached the maximum on the next ninth days. Between different bagging treatments, the carotenoid content of unbagged fruit was slightly higher than that of the white single-layer paper bag, and the outer yellow inner black paper bag was the lowest (Figure 2).



**Fig. 2.** Effect of Different Fruit Bags on Carotenoid Content in Peel of Chinghuang Mango in the process of aging

## 3 DISCUSSION

Bagging the outer yellow inner black composite paper bag was significantly reduced the content of chlorophyll and carotenoids of Chinghuang mango peel in its process of aging. The content of chlorophyll and carotenoid in the peel was significantly higher than that of the outer yellow and black composite paper bag, and the white single layer paper bag had great differences in color compared to the un-jacketed fruit. The shading rate of the outer yellow inner black paper bag was higher than that of the white single paper bag. The inhibition of the chlorophyll and carotenoid in the peel was more obvious than that of the white single paper bag and the un-jacketed fruit.

The skin color is the result of interaction of various related pigments [1]. The color of the peel is the comprehensive performance of chlorophyll, carotenoids, flavonoids, and anthocyanins. such as after using different types of bags can change partial light and temperature condition of the fruit development, effect the metabolism of skin pigment, so as to improve the color and quality of fruit[2]. A large number of studies have shown that bagging can promote the synthesis speed and accumulation of anthocyanins in fruit peel of apple at maturity, while reduces the content of chlorophyll in fruit peel, changes the color background of fruit, and makes the fruit colorful [3]. The content of the photosensitive pigment was increased after the bagging, and the chlorophyll content was decreased. The pear surface was colored rapidly after picking the bag. At the same time, the anthocyanin color background was improved, and the bagged pear was fresh red. In this study, the color change of the fruit of Chinghuang Mango without control was more obvious (Figure 3). The bagging obviously inhibited the synthesis of chlorophyll

and carotenoid in the peel, but the change of anthocyanin content in the peel had to be further studied.



**Fig. 3.** The effect of different fruit bags on the pigmentation of the fruit peel in the ripening process of Chinhuang mango.

In addition, through observation, it was found that different bags can significantly improve the appearance of Chinhuang mango, and the skin has a high degree of smooth finish. Because bagging avoids permanent scars on the peel and wound stream juice corrosion peel due to mechanical friction caused by external forces[4]. In addition, bagging can reduce the number of spraying pesticides, thus reducing production costs and producing pollution-free green fruits [5].

## References

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