Coatings for Cucumber Preserving

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ABSTRACT: Coatings can be a new method for cucumber preservation. Coating materials ware selected from galangal, forsythia, and gardenia. Galangal coating can reduce weight loss, retard the decrease of exudate levels and receive better sensory evaluation. Based on these findings, another two coating materials, propolis and chitosan, compared their effects with galangal. From one-dimensional analysis of variance multiple comparisons (Duncan), galangal worked best in the way of sensory evaluation, and propolis coating provided active elements in the maintenance of exudate content. Chitosan coating retarded the decline of hardness and maintained soluble solids and Vc content. All in all, through comprehensive analysis of various indicators ,chitosan coating was better than galangal and prpolis.

Key words: freshness; coating; propolis; chitosan; galangal; cucumber

1.Introduction

1.1.Materials

Cucumber (purchased in the market): size uniform, the same maturity, no damage.

1.2.Instruments and equipments

Tab. 1 the main instruments of test

Name	Model	Origin
Electronic Balance	BL620	Shimadzu
Fruit hardness tester	GY-1	Mudanjiang City Machinery Research Institute
Hand-held **Refractometer**	WYT	Thailand and China, Chengdu Optical Co. Ltd.
Sealing machine		Industrial Machinery Equipment Co. Ltd.

1.3.Method designing

Cucumber will be coated and air-dried naturally.[1]

1.4.Test Method

1) Sensory evaluation

Each time call 10 people to make five evaluations.

Table 1 Sensory evaluation

Item		Score				
Appearance	***Color***	5	4	3	2	1
		unchanged	◄		►	yellowing
	Flower	5	4	3	2	1
		fresh				shedding
	Thorn	5	◄	3	►	1
		hard	◄		►	inermis
olfactory	**odor**	5	4	3	2	1
		No odor	◄		►	Significant odor
taste	***taste***	5	4	3	2	1
		Inherent taste	◄		►	Significant odor

2）weight loss

The before and after weight of a sample was weighed by the Electronic balance，and then the weight loss rate was derived by the formula：

$$A = \frac{W - Wi}{W} \times 100\% \quad (1)$$

Where A——Weight loss，%；

W——The original quality of the sample，g；W_i——The quality of the sample of each determination，g；

3）Exudation assay

4g cucumber was weighed and loaded between two pieces of filter paper. And the pressure of 100N was used to press for 30s, then the increased content of the weight should be exudation.

4）Hardness

The GY-1-type hardness tester was used to measure on the top of, in the middle of and at the bottom of the cucumber seperately. Each site was tesed for five times and the average value was gotten.

5）Determination of soluble solids content[2]

Soluble solids (mainly soluble sugar) contents in the fruit and vegetable samples directly reflect the quality and maturity of fruits and vegetables and are the important indicators to determine storability. The determination method is relatively simple, using hand-held Refractometer. First, emend the focal length and position of calibration ruler, then squeeze 1 to 2 drops of juice from the fruit, carefully drop at the centre of prism plane, rapidly closing auxiliary prism, put it aside for 1 min and regulate the achromatic ring towards a bright light. Then the dividing line of bright and dark and their corresponding readings was appeared in the field of vision, that is, the percentage of soluble solids was contained in the fruit juice at 20℃. If the testing environment is not at 20℃, the emendation could be made accroding to increased or decreased number of compensate thermometer attached to the equipment.

Each sample was measured repeatedly for three times and the average value was gotten.

6）Determination of fruit Vc content

Determination of fruit Vc content is to use the 2,6 - dichloro-indophenol sodium salt titration. 10g chopped samples was weighed, placed in a mortar, added a little 2% oxalic acid solution and crushed; then poured into 100ml flask, added 2% oxalic acid, and diluted it to the scale. The kaolin was used to bleach and filtrate. Draw 20ml filtrate into the flask, using re-calibration of 2,6 - dichloro-indophenol titration sodium solution to pink up to 15 seconds without fading, and then note the amount of dye (V). Draw 10ml 2% oxalic acid solution, marking down volume (V1) with the dye as the blank titration. Calculated as the formula[3、4]:

$$W = \frac{(V - V_1) \times A}{B} \times \frac{b}{a} \times 100\% \quad (2)$$

Where W - the milligram amount of of ascorbic acid contained in the 100g sample, mg/100g;

V – the milliliter amount of dyes used by the titration sample ,ml;

V1 - the milliliter amount of dyes used by blank titration, ml;

A – the equivalent amount of 1ml dye solution to the milligram amount of ascorbic acid, mg / ml;

B - the milliliter amount of sample solution when titrating, ml;

b - the milliliter amount after the sample solution diluted, ml;

a – sample quality, g.

2.Results and discussion

2.1.Chinese herbal medicine filter

1)Sensory evaluation

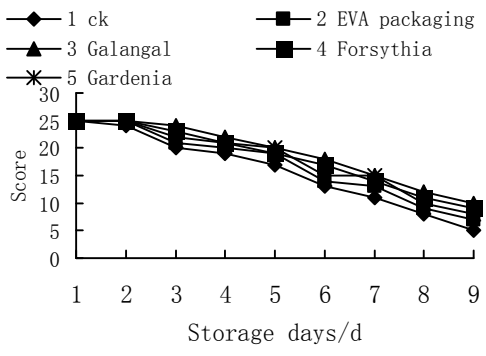

Fig.1 Effect of herbal treatment on the cucumbers' sensory evaluation

Figure 1 indicated the the impact of cucumber sensor evaluation by different processing methods. As can be seen, on the third day, the specimen 3, 4and 5had no significant change compared with the previous two days. On the sixth day, the color of the sample 1became yellow, the flowers and thorns were off, there was a slight odor, and it was non-edible; the color of sample 2 became yellowish, the flowers and thorns were off, and it had no abnormal smell and was edible; the colors of sample 3, 4 and were still green, flowers and thorns of a small number of samples did not fall off, and there was no abnormal smell and it was edible. On the ninth days, some specimens of the specimen 3, 4 and 5, was yellowing, there were no thorns and no flowers, and some of them smell peculiarly, most of which are non-edible. Among them, the evaluation of sample 3 in the whole process of of storage was slightly higher than the sample 4 and 5. Thus throughout the storage period, the specimen 3 had the relatively high evaluation.

2)Weight loss

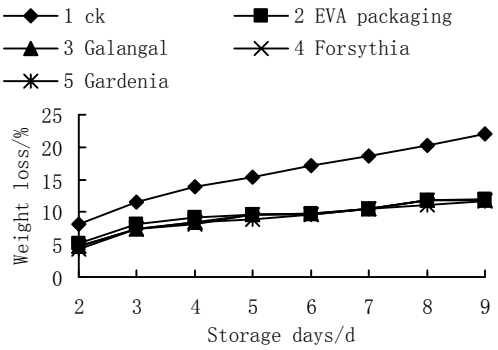

Fig. 2 Herbal treatment on weightlessness of cucumber

Weight loss rate is one of the most important and direct indicators for measuring fresh fruits and vegetables storage. As can be seen from Figure 2, throughout the storage process, because nutrients were consumed due to respiration and evaporation of the cucumber, weight loss rate was gradually increased with the extended storage period. On the second day, the weight loss rates of specimen 3, 4 and 5 were 4.72%, 4.71%, 4.26% respectively. So it was obvious to conclude that weight loss of the specimen 1 was significant in the early storage period. On the ninth day, the weight loss rates of the specimen 3, 4and 5were 11.87%, 11.9% and 11.76% seperately. Weight loss of the sample 1 had been far higher than the other four sets of samples. In the storage process, weight losses of the sample 1 at different times were higher than those in other four groups of samples, but there was no significant difference among the sample 2, 3, 4 and 5.

3) Exudate levels

Figure 3 indicated the effect of different processing on the content of exudate. During the process of the cucumber storage, exudate content was increased at first, then downward. The after-ripening phenomenon of the

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cucumber made exudate levels rise. The loss of water and nutrients made the exudate significantly decline when the fifth day was coming. On the exact fifth day, it reached the highest value. Among them, the exudation of sample 3 was significantly superior to other four group samples, and it reached the maximum value 0.648g/100gFW on the fifth day.

2.2.Different natural preservative coating comparison

1）Sensory evaluation

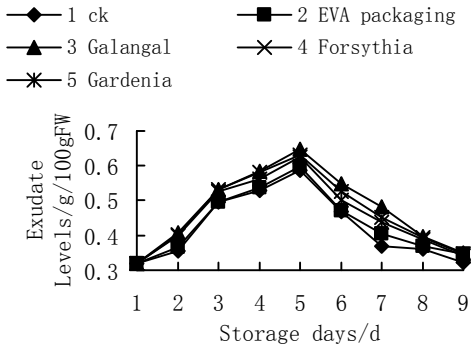

Fig. 3 Effect of herbal treatment on the content of cucumbers' exudate content

Table 3 Sensory evaluation

sample	N	a subset of alpha = .05
		1
1	9	15.67
2	9	17.56
3	9	19.00
4	9	19.44
5	9	20.00
Significant		.148

Table 4 weightlessness

sample	N	a subset of alpha = .05	
		1	*2*
3	9	8.0578	
4	9	8.1733	
5	9	8.2256	
2	9	8.4533	
1	9		13.9011
Significant		.866	1.000

From the Duncan multiple comparison of variance of one-dimensional point of view, the higher sensory evaluation scored, the better preservation of cucumbers it indicated. The last line of the table was the mean homogeneity of variance test, where p = 0.148> 0.05 showed that the variance in each group had homogeneity. From Table 5 we could see, the first line was a specimen which was ranked according to the number of small to large order, therefore, in the sensory evaluation of the indicators, the best effect of storage and preservation was the sample 5 and the sample 4 was the next.

2）Weight loss

From the Duncan multiple comparison of variance of one-dimensional point of view, the lower the rate of weight loss was, the better preservation of cucumbers it indicated. The last line of the table was the mean homogeneity of variance test, where p1 = 0.866> 0.05 and p2 = 1.000> 0.05 showed that the variance in each group had homogeneity. The average values of five groups of specimens were not in the same column, which indicats that there was a significant difference. From Table 3 we could see that the smaller the mean number was, the small the weight loss was, therefore, the sample 3 had the best effect, and the sample 4 was the next. However, the sample 1 was not in the same line with other four groups of samples, which indicated that there was significant difference between the sample 1 and the other four group samples.

3）Exudate levels

Table 5 Exudate levels

sample	N	a subset of alpha = .05
		1
1	9	.42289
4	9	.43411
2	9	.43433
5	9	.44733
3	9	.47422
Significant		.342

Table 6 hardness

sample	N	a subset of alpha = .05	
		1	*2*
1	9	10.6456	
2	9	11.0122	11.0122
5	9	11.1044	11.1044
3	9	11.1867	11.1867
4	9		11.4822
Significant		.114	.169

From the Duncan multiple comparison of variance of one-dimensional point of view, the higher exudate levels was, the better Preservation of cucumbers it indicated. The last line of the table is the mean homogeneity of variance test, where p = 0.342> 0.05 showed that the variance in each group had homogeneity. From the exudation content perspective, the larger average was, the more water and nutrient composition contained in the cucumber sample, which indicated the better effect of

storage and preservation of cucumber. Therefore on the exudate levels, the sample 3 was the best sample, and followed by the sample 5.

From the Duncan multiple comparison of variance of one-dimensional point of view, the higher the hardness was, the better preservation of cucumbers it indicated. The last line of the table was the mean homogeneity of variance test, where p1 = 0.114> 0.05 and p2 = 0.169> 0.05 showed that the variance in each group had homogeneity. The average of five groups of specimens were not in the same column, indicating a significant difference. Figure 5 showed that the sample 4 was the best specimens, and followed by the specimen 3.

Table 7 hardness

sample	N	a subset of alpha = .05
		1
1	9	10.8700
2	9	10.8911
5	9	11.1544
3	9	11.2611
4	9	11.4400
Significant		.060

Table 8 hardness

sample	N	a subset of alpha = .05
		1
1	9	10.5100
2	9	10.5622
5	9	10.6000
3	9	10.6422
4	9	10.8000
Significant		.383

Table 9 TTS content

sample	N	a subset of alpha = .05
		1
1	9	4.0667
2	9	4.1367
3	9	4.1767
5	9	4.2044
4	9	4.2678
Significant		.286

From the Duncan multiple comparison of variance of one-dimensional point of view, the higher the hardness was, the better Preservation of cucumbers it indicated. The last line of the table was the mean homogeneity of variance test, where p = 0.06> 0.05 showed that the variance in each group had homogeneity. Figure 6 told that the sample 4 had the best effect of preservation, and followed by the sample 3.

From the Duncan multiple comparison of variance of one-dimensional point of view, the higher the hardness was, the better Preservation of cucumbers it indicated. The last line of the table was the mean homogeneity of variance test, where p = 0.383 > 0.05 showed that the variance in each group had homogeneity. From Figure 7 we could see, the sample 4 was the best preserved specimen, followed by the specimen 3.

From the Duncan multiple comparison of variance of one-dimensional point of view, the higher the soluble solids content was, the better Preservation of cucumbers it indicated. The last line of the table is the mean of homogeneity of variance test, where p = 0.286> 0.05 showed that the variance in each group had homogeneity. From Table 8 we could see, the sample 4 was the best preserved specimen, followed by the specimen 5.

Table 10 Vc content

sample	N	a subset of alpha = .05
		1
1	9	51.8100
2	9	52.9833
3	9	54.4678
5	9	55.5278
4	9	57.7822
Significant		.443

From the Duncan multiple comparison of variance of one-dimensional point of view, the higher the Vc content was, the better Preservation of cucumbers it indicated. The last line of the table is the mean of homogeneity of variance test, where p = 0.443> 0.05 showed that the variance in each group had homogeneity. From Table 9 we could see, the sample 4 had the best effect, followed by the specimen 5.

3.Conclusions

Through comparison each index of the different coating materials processing cucumber samples during storage period, here come the following conclusions[5、6]:

1) The specimens processed by the Chinese herbs (Alpinia galanga, forsythia, gardenia) were superior to the samples with no treatment, indicating the specimen coated by Chinese herbal medicine during storage time had positive effect for maintaining the quality. Among them, each index of Alpinia coating had the best result during storage period.

2) Three different natural coating preservative, that is, propolis, Chitosan, gardenia were used to coat cucumber and through the Duncan multiple comparison of variance

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of one-dimensional, Alpinia galanga coating processing sensory evaluation was the best; as for the weight loss rate, the cucumber samples processed by three kinds of coating materials were not significantly different; the specimens processed by propolis coating played an active role in the exudate levels; the specimens processed by chitosan coating preservation treatment had the best results on maintaining the hardness; from the natural coating materials maintenance on the soluble solids point of view, cucumber samples processed by chitosan coating had the best effect on soluble solids maintenance; the specimen treated by chitosan coating reduced the losses of Vc content.effectively

Through the comprehensive analysis of various indicators of cucumber specimens processed by different natural coating preservatives, chitosan coating processing cucumber samples was better than cucumber samples processed by Galangal and propolis coating.

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