The Research of Longan Fresh-keeping Packaging Technique

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Abstract: The longan is suitable for the tropical zone subtropics in heat season. The flesh fruit is much in juicy, low in acid, high in sugar. The keep fresh techniques are the civilian traditional technique, low temperature gas adjusting technique, medicament preventing decayed technique and smoking sulfur fresh-keeping technique. The experiment used the method of comparative experiments. There were two packaging materials, including PA/PE compound membrane and PE membrane. Each material corresponded two parts of experiments, soaking specific density of NaCl and Vc solution, and boiling the longan in boiling water for 5~10s. The experiment indicated that, the longan after being boiled tasted best but looked a little bad. A certain density of NaCl or Vc solution would increase the speed of rotting. Vc and NaCl mixture could slow down the speed of rotting, keep longan fresh for a long time and make sure that the juicy was sweet. Comparing with common longan on sales, these methods could all reduce the lost of sweet juicy. Also, comparing the two packaging materials, we could see that, PA/PE compound membrane had a better effect to keep longan fresh. On conclusion, it was the most effective fresh-keeping method to use Vc and NaCl mixture and PA/PE compound membrane.

Keywords: Longan; preservation; preservation technique; fresh-keeping

1. Introduction

Longan is a kind of rare fruit in south subtropical zone. Because of maturing in high temperature environment and exuberant metabolism, fresh longan is liable to change color and go bad. Finally it's difficult for transportation and storage. At room temperature, within 3-4 days, the peel of longan will turn brown. Besides, the pulp will be soft, bleed and decompose, which is called autolysis [1]. The browning includes enzymatic browning and non-enzymatic browning, corresponding to polyphenol oxidase (PPO) and peroxidase (POD) [2, 3]. Also, the inclusions of pulp, such as suger-acid ratio, the ratio of soluble solid content to titration acid, Vc and carotenoid will change a lot after storage for a long time [4, 5]. For antiseptic treatment, from the standpoint of sterilization and inhibition of enzyme reaction, some inhabitors for PPO have been found, including citric acid, salt, sulphite, Vc and so on [6]. The key of fresh-keeping is to restrain the activity of the related browning enzyme and slow down the material metabolism so as to antisepticise and prevent spoilage [7]. There are some existing fresh-keeping methods, such as normal storage, low-temperature gas storage, sulfuring preservation, controlled-atmosphere storage, blanching treatment, frozen preservation and so on [8]. However, these methods need certain special equipments and cost a lot. As a result, they are not suitable for ordinary consumption.

In this study, blanching treatment and Chemical treatment (0.5g/L NaCl, 10g/L Vc, and 0.5g/L NaCl+10g/L Vc) are used together with packaging bags made from PE film and PA/PE composite film, which are economical fresh keeping materials and in common use. By measuring the sensory evaluation, weight loss rate, and titrable acidity, we can pick out a more effective fresh-keeping material and treatment. In order to accelerate the process of experiment, the experiment is performed at room temperature.

2. Experimental

2.1. Materials

Prepare 270 grains of fresh longan divided into 9 groups, and each group has 3 packets, every 10 longan as a packet. PA/PE composite membrane and PE fresh-keeping film are separately made into packaging bags. The size of each bag is 17cm×11.5cm, 12 bags for each film.

2.2. Methods

1) Pretreatment

a) Blank control: 3 packets of longan are placed directly in the open boxes without any fresh keeping treatment.

b) Blanching treatment: immerse 2 groups of the longan in boiling water with a colander for 5 to 15 seconds (not scalding the fruit pulp). After air drying, put them into two kinds of packaging bags separately, exhaust and then seal the bags.

c) Chemical treatment1,2,3: immerse 3 groups of fresh longan in 3 kinds of solutions separately (0.5g/L NaCl, 10g/L Vc, and 0.5g/L NaCl +10g/L Vc) for 5 minutes. After air drying, put them into two kinds of packaging bags, exhaust and then seal the bags.

2) Measuring indexes

a) Sensory evaluation: According to ergonomic principles, fruit peel, shape, ear stalk, flavor, and pulp of the longan are all scored every 4 days, using 1,2,3,4,5

point instead of five leaves (worse, bad, ordinary, good and better).

b) Weight loss rate: Using weighing method, measure the weight loss every 4 days. The precision reaches to 0.1g.

c) Determination of titrable acidity: According to GB/T12293-90 Fruit and vegetable products — Determination of titratable acidity, using indicator titration method, with the mmol number of hydrogen ions per 100g representing titratable acidity. Round to the nearest tenth.

3. Results and discussion

3.1. Sensory evaluation

Table 1 and Figure 1 show us that compared to the control group, the other eight kinds of methods are effective. Sensory evaluation of the control group is worst. The test groups with composite film packaging rank top four. Compared to the groups of PE film packaging, those of PA/PE composite film packaging are better at sensory evaluation. With the same packaging, groups of Chemical treatment 3 show best performance, and blanching treatment ranks secondly with the best flavor. The other two Chemical treatments make the flavor better, but prick up the mildew of ear stalk.

Table 1 Values of the sensory evaluation

Film	Treatment	day			Score and Order	
		4th	*8th*	*12th*	*total*	*Order*
PE	Blanching	18	15	14	47	5
	Chemical 1	15	11	11	37	9
	Chemical 2	16	13	10	39	8
	Chemical 3	18	14	15	47	5
PA/PE	Blanching	22	20	20	62	2
	Chemical 1	18	16	14	48	4
	Chemical 2	18	16	15	49	3
	Chemical 3	23	22	22	67	1
--	Control	20	15	10	45	7

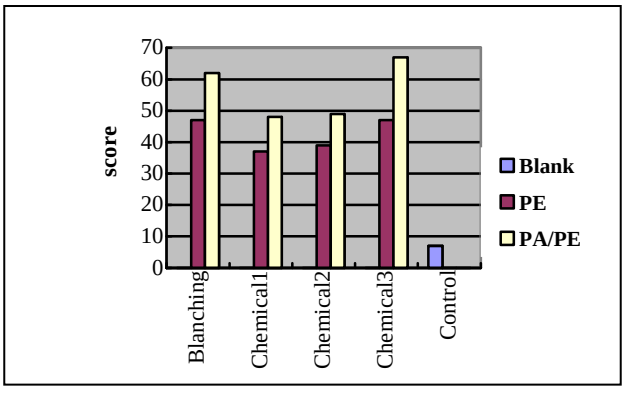

Figure 1 Total score of sensory evaluation

3.2. Weight loss rate

Table 2 Values of weight loss rate

Film	Treatment	Weight Loss Rate (%)		
		4th day	*8th day*	*12th day*
PE	Blanching	0.58	1.23	1.61
	Chemical 1	0.61	1.26	1.64
	Chemical 2	0.54	1.14	1.81
	Chemical 3	0.5	1.52	1.79
PA/PE	Blanching	0.5	1.01	1.29
	Chemical 1	0.54	1.12	1.34
	Chemical 2	0.41	0.75	1.65
	Chemical 3	0.42	0.78	1.24
--	Blank control	10.27	18.77	28.09

Table 2 shows that compared to the control group, the other eight groups have little change in weight loss. Compared to the groups of PE film packaging, those of PA/PE composite film packaging have the smaller average of weight loss rate and the change range. With the same packaging, groups of blanching treatment and Chemical treatment 3 are good at reducing water loss.

3.3. Determination of titrable acidity

Table 3 Values of titratable acidity

Film	Treatment	Titrable Acidity (mmol/100g)		
		4th day	*8th day*	*12th day*
PE	Blanching	0.26	0.14	0.27
	Chemical 1	0.11	0.29	0.2
	Chemical 2	0.19	0.22	0.22
	Chemical 3	0.25	0.25	0.28
PA/PE	Blanching	0.66	0.44	0.46
	Chemical 1	0.16	0.37	0.42
	Chemical 2	0.16	0.28	0.29
	Chemical 3	0.14	0.21	0.26
--	Blank control	0.27	0.5	0.76

Table 3 shows that the control group has comparatively big change in the titratable acidity. With PA/PE composite film packaging, the group of Chemical treatment 3 has the smallest change in the titratable acidity. With PE film packaging, the groups of Chemical treatment 2 and 3 are more effective.

4. Conclusions

PE film packaging and PA/PE composite film packaging both react on fresh-keeping of fresh longan. The effect of PA/PE composite film packaging is better because of its excellent moisture barrier property and gas barrier property. It's good stiffness and tensile bond strength make it easy to prepare packaging bags. PE film is of good stiffness and air permeability which goes against

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the inhibition of respiration.

Blanching treatment and Chemical treatment are obviously effective. Among them, Chemical treatment 3 (0.5g/L NaCl+10g/L Vc) is the most effective method since it provides good flavor and sensory evaluation, little change in the weight loss and titratable acidity. Blanching treatment provides the best flavor and little change in the weight loss and titratable acidity, except for poor appearance. Chemical treatment 2 (10g/L Vc) pricks up the mildew of ear stalk, while Chemical treatment 1 (0.5g/L NaCl) has the relatively obvious change in the titratable acidity.

In conclusion, we can combine PA/PE composite film packaging with blanching treatment or Chemical treatment 3 (0.5g/L NaCl+10g/L Vc) to obtain excellent preservation effect at room temperature. In this research, the packaging film and the solution are cheap and easy to obtain so as to promote this method. For better preservation effect, we can also combine this method with low temperature storage (3-5℃) and high humidity condition (90-95%).

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