Innovation in Coated Active Packaging Production from Durian Peel for Improvement the Efficiency in Peeled Durian Wrapping

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DETAILS OF TARGETED RESEARCH PLAN

Project title:
Innovation in Coated Active Packaging Production from Durian Peel
for Improvement the Efficiency in Peeled Durian Wrapping

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IMPORTANCE AND PROBLEM SOURCE FOR PROMOTED AND SUPPORTED RESEARCH ACTIVITIES

Storage of durian is an important factor for delivering the durian product to the global market. Factors contributing the stability of the product consist of temperature control, relative humidity, atmosphere and packaging characteristics.

Generally, the shelf life and persistence of durian products are reduced when durian is stimulated by these environmental factors. In addition, the production of ethylene gas, which stimulates the respiratory rate and can be a tissue-affecting hormone that accelerates the rate of plant aging. The ethylene production of fruit is usually low. However, the amount of such gas will increase when the fruit ripens, resulting in rapid yield deterioration. Therefore, controlling the amount of ethylene gas production is the key to maintaining the yield.

Researcher teams of Kasetsart Agricultural and Agro-Industrial Product Improvement Institute and Biodegradable Packaging for Environment Public Co., Ltd. have realized the importance of utilizing durian pulp for the production of paper and environmentally friendly packaging. Therefore, we have an idea to create active packaging products from durian peels to increase the performance of the packaging for containing peeled durian, to commercialize delivery the pulp to the packaging industry.

It can be seen that this project helped to promote the development of agricultural by-product management potential to be able to compete in the world market according to the industrial policy, increase income for community enterprise group, and promote the connection between farmers and the packaging industry. It may also result in the development of potential and ability to manage utilization of other agricultural by-products in the future as well.

ABSTRACT

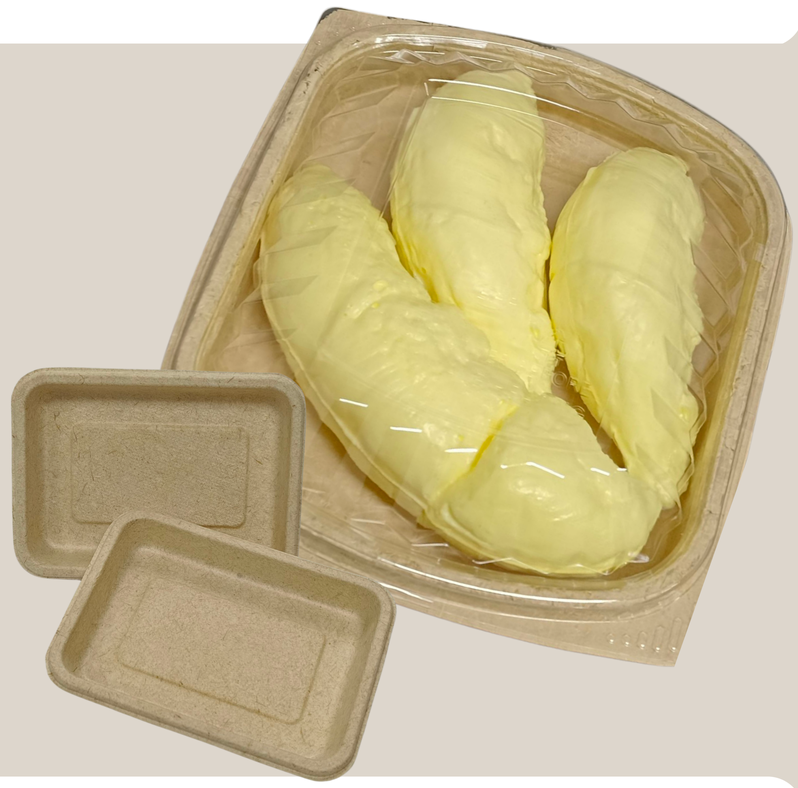
This research aimed to cultivate the specific characteristics of durian and use as a guideline for production of active packaging from durian peel coated by encapsulation method to enhance the efficiency of the packaging for wrapping the peeled durian, and to analyze the cost-effectiveness and the possibility of applying the innovation in industry in order to add value to durian commercialized both in Thailand and for exporting abroad.

In this research, determination of conditions for preparation of pulp by boiling using environmentally friendly substances was carried out. Durian peel was soaked in potassium hydroxide (KOH) and boiled at 100°C under close system for 1.30 h. The KOH concentrations were varied at 10, 15 and 20% of dried durian peel. Then the pulp was bleached and the bleaching conditions were varied to be A10 A15 and A20. The pulp was bleached at 90°C for 2.30 h with 3% hydrogen peroxide (H_2O_2), 3% sodium hydroxide (NaOH) as well as 0.4% catalyst C and 0.2% catalyst D. After bleaching, the pulp was molded to make a paper (base weight about 100 g/m^2). It was found that the pulp prepared at conditions A10 and A15 did not suitable to be molded by a lab scale paper forming machine in KAPI Institute. Only the pulp prepared under A20 condition could be molded; however, it was quite difficult to remove the paper from the net of the machine.

The paper prepared under condition A20 was further characterized. Tear index, tensile index, burst index and folding endurance were found to be 8.48, 0.2576, 0.8425 and 1.1104, respectively.

As forming paper from durian pulp was difficult, our research team then tried to mix pulp from durian peel with the pulp from bamboo. The proportions of durian pulp to bamboo pulp were varied to be 40 : 60, 50 : 50, 60 : 40 and 70 : 30. The suitable proportion of pulp from durian peel to pulp from bamboo was found at 70:30 with tear index, tensile index and burst index of 10.39, 0.3016 and 1.1194, respectively. In addition, it gave base weight of the paper to the minimum at 86.17 g/m^2.

Then the coated active packaging was designed, with antimicrobial and odor removal properties, for practical application. Besides, small size packaging was prepared to measure drainage and paper forming performance of the machine. It was found that the pulp with these conditions could be formed to gain active packaging.



RESEARCH OBJECTIVES

- To cultivate the specific characteristics of durian and use as a guideline for production of active packaging from durian peel coated by encapsulation method to enhance the efficiency of the packaging for wrapping the peeled durian
- To analyze the cost-effectiveness and the possibility of applying the innovation in industry in order to add value to durian commercialized both in Thailand and for exporting abroad.

METHODOLOGY

Fiber manufacturing processes using fiber residues by mechanical and chemical methods were developed in order to reduce the use of chemicals and reduce the amount of waste generated from the production process. In addition, the development of suitable conditions for forming paper containers and development of packaging preparation were performed with emphasis on biodegradability to determine the quality of suitable containers.

SUGGESTION

Due to forming paper using only durian pulp (with short fiber) as a raw material was difficult. Therefore, the pulp from durian peel should be mixed with the longer fiber pulp (such as bamboo) to enhance the possibility of paper forming.

RESEARCH RESULTS

Optimum conditions for production of coated active packaging (paper) to increase the efficiency for warping peeled durian are the durian pulp prepared under condition A20 with tear index, tensile index, burst index and folding endurance were found to be 8.48, 0.2576, 0.8425 and 1.1104, respectively. However, forming paper from durian pulp was difficult. The combination of durian pulp and bamboo pulp was performed. The proportions of durian pulp to bamboo pulp were varied to be 40 : 60, 50 : 50, 60 : 40 and 70 : 30. The suitable proportion of pulp from durian peel to pulp from bamboo was found at 70:30 with tear index, tensile index and burst index of 10.39, 0.3016 and 1.1194, respectively. In addition, it gave base weight of the paper to the minimum at 86.17 g/m^2.

Material	Tear index	Tensile index	Burst index
Durian pulp	8.48	0.2576	0.8425
Durian pulp and bamboo pulp	10.39	0.3016	1.1194

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