



Effect of pretreatment on browning of jackfruit rind

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Abstract

The jackfruit rind, which is rich in fiber and pectin are discarded along with the skin, because the process of separating the fruitlets from the rind is a laborious process, hence it is wasted due to lack of post-harvest technological interventions. Enzymatic browning is the second largest cause of quality loss in fruits and vegetables. Enzymatic browning is the discoloration which occurs due to the action of a group of enzymes called polyphenol oxidases (PPO), which is reported to be present in all plants. The occurrence of enzymatic browning in Koozha and Varikka jackfruit rinds which were immersed in different pre-treatment media were evaluated after 4 hours. The overall visual quality of the treated were analysed

Keywords: jackfruit rind, enzymatic browning, pre-treatment

Introduction

Jackfruit (*Artocarpus heterophyllus*) is commonly grown in home gardens of tropical and sub-tropical countries. Besides their delicious taste and flavor, they are known to reduce the risk of several chronic diseases (Alesiani *et al.*, 2010. Ushimaru *et al.* 2007) [1, 8]. Jackfruit is considered to be an underutilized fruit, because most of the fruits get wasted due to less awareness of utilization methods, lack of post-harvest technology and gaps in supply chain systems. Jackfruit generates huge amount of solid wastes, as its seeds and rinds (Krishna *et al.*, 2006) [3]. The post-harvest losses in jackfruit is around 30-35 per cent during the glut season (Lakshminarayan, 2017) [5]. In order to reduce the wastage and negative effect to the environment, beneficial compounds such as pectin of jackfruit rinds, can be extracted (Koh *et al.*, 2014) [2]. The peel waste of jackfruit has been suggested for anaerobic bio hydrogen production (Krishna *et al.*, 2006) [3].

From the quality perspective, it is desirable to preserve the characteristics of fresh-cut fruits and vegetables at their peak. Obviously, any food product should be safe for consumption and fresh-cut products are very sensitive to contamination. Among the limitations to shelf-life of fresh-cut products are: microbial spoilage, desiccation, discoloration or browning, bleaching, textural changes and development of off-flavor or off-odor (Rosen *et al.*, 1989) [7]. There are several reports highlighting the integral exploitation of bioactive compounds from these wastes and their potential applications as antioxidants, antimicrobials and also as flavoring, colorant and texturizing agents (Kumar *et al.*, 2011) [4]. Solid wastes, particularly from processing such as peels and cores, typically have high nutritional value and are used as animal feeds. (Vikash kandari *et al.*, 2012) [9].

Among the consequences of mechanical injuries, increase in Respiration rate and ethylene production, accelerated

Senescence and enzymatic browning are the major changes. Different types of chemicals are used in the control of browning which act directly as inhibitors of PPO, whereas others act by rendering the medium inadequate for the development of the browning reaction.

Materials and Methods

Raw materials

Jackfruit cultivars *Koozha* and *Varikka* were selected for the conduct of this study. The matured jackfruits were procured from the Instructional Farm, College of Agriculture, Vellayani, and Thiruvananthapuram.

Raw mature jackfruits of 90-105 days after fruit set, with optimum visible maturity indices were selected. The fruits were chosen in this state because, raw mature jackfruits are suitable for the better yield of jackfruit rind, as the thickness of the rind diminishes with ripening of the fruit.

After harvesting, the fruits were cleaned under running water. The physical characteristics of *koozha* and *varikka* jackfruit were ascertained. The thorns and outer skin of jackfruit were removed. Jackfruit rind was separated from the fruit and perianth. The thickness and weight of the rind was measured and the rind was cut into equal sized cubes of size 2 cm × 1.5 cm (length × breadth).

Pre-treatment media

The occurrence of enzymatic browning in *Koozha* and *Varikka* jackfruit rinds which were immersed in different pre-treatment media were evaluated after 4 hours. The color change of *Koozha* and *Varikka* jackfruit rind from white to brown was observed after 4 hours. The composition of different pre-treatment media used to control the enzymatic browning in jackfruit rinds are listed in the Table: 1

Table 1: Composition of different pre-treatment media used

Sl. No.	Pre-treatment media	Quantity (%)
1.	Control	No treatment
2.	Citric acid solution	1
3.	Salt solution	1
4.	Sugar solution	1
5.	Lime juice	1

Quality evaluation

Appearance is the criteria for the desirability of any food product. The best treatment was identified by analyzing appearance of *koozha* and *varikka* jackfruit rinds in different pre-treatment media by a group of 10 semi trained panel members and the results are listed in the table: 2.

Results and Discussion

The difference in browning of *koozha* and *varikka* rinds in different media is given in the plates: 1 and 2 respectively. The observation of *koozha* and *varikka* rinds in different media is given in the table: 2 and 3 respectively.



Fig 3a. Initial observation - 1% salt soln

Fig 3b: After 4hours



Fig 1a: Initial observation-Control

Fig 1b: After 4 hours



Fig 4a: Initial observation -1% sugar soln

Fig 4b: After 4hours



Fig 2a: Initial observation- 1% citric acid soln

Fig 2b: After 4hours



Fig 5a: Initial observation - 1% Lime juice

Fig 5b: After 4hours

Plate 1: Comparison of browning of Koozha rinds in different Pre-treatment media

Table 2: Browning outcomes of *koozha* rinds

S. No.	Treatment	At initial	After 4 hours
1.	Control	Milky white	Browning was observed around the rind
2.	1 % Citric acid	Milky white	Remains white
3.	1 % salt solution	Milky white	No color change until 2 hours. A slight tint of brown was seen at the corners of the rinds
4.	1 % sugar solution	Milky white	No color change until 2 hours. A slight tint of brown was seen at the corners of the rinds
5.	1 % Lime juice	Milky white	Remains white with bleached effect

Koozha rinds in the pre-treatment media was observed for their color change due to enzymatic browning after 4 hours.

At the beginning the *koozha* rinds were milky white in colour. After 4 hours, control treatment turned brown, in 1 per cent

citric acid solution the *koozha* rinds retained their white colour, whereas in 1 per cent salt solution and 1 per cent sugar solution there was no color change until 2 hours and thereafter there was a slight tint of brown at the corners of the rinds. In 1 per cent lime juice *koozha* rinds were seen to have a white color with bleached effect.

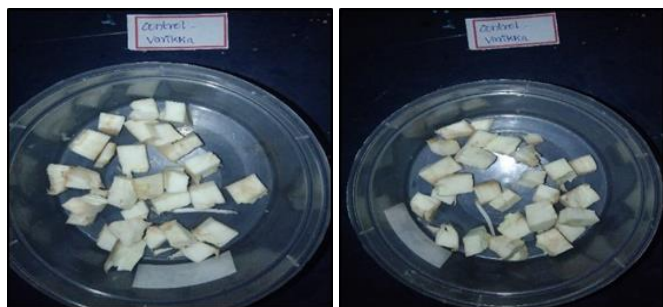


Fig 6a: Initial observation-Control fig 6b: After 4 hours

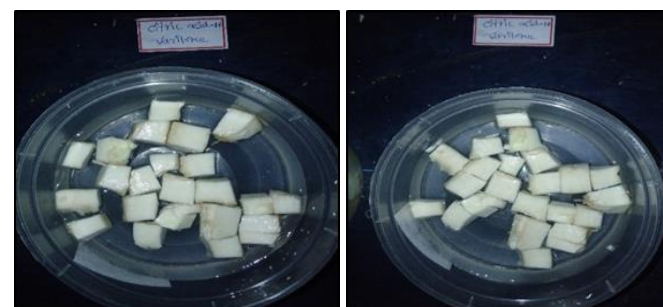


Fig 7a: Initial observation
1% citric acid soln Fig7b: After 4hours



Fig 8a: Initial observation
- 1% salt soln fig 8b: After 4hours

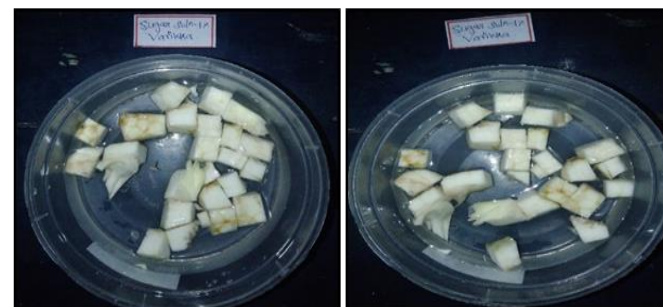


Fig 9: Initial observation -
1% sugar soln Fig 9: After 4hours

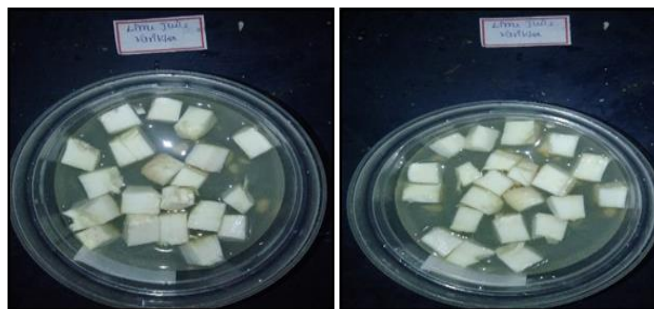


Fig 10a: Initial observation Fig 10: After 4hours
1% Lime

Plate 2: Comparison of browning of *Varikka* rinds in different Pre-treatment media

Table 3: Browning outcomes of *varikka* rinds

SL. No	Treatment	At initial	After 4 hours
1.	Control	White	Remains white
2.	1 % Citric acid	White	Bright white
3.	1 % salt solution	White	No change in color
4.	1 % sugar solution	White	No change in color
5.	1 % Lime juice	White	Remains white with bleached effect

Varikka rinds in the pre-treatment media were observed for their color change due to enzymatic browning after 4 hours. At the beginning the *varikka* rinds were white in colour. After 4 hours, the control treatment retained their white colour, in 1 per cent citric acid solution the *varikka* rinds retained their white colour, whereas in 1 per cent salt solution and 1 per cent sugar solution there was no color change after 4 hours. In 1 per cent lime juice, *varikka* rinds were observed to retain their white color with bleached effect.

Conclusion

From this study, the browning was observed to be higher in *koozha* rinds than *varikka* rinds. In the presence of different pre-treatment media, it was seen that *koozha* and *varikka* rinds retained their white colour in 1 per cent citric acid solution. The greater browning of *koozha* rinds was due to the higher polyphenol content present in them than *varikka* rinds.

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