A REVIEW ON ALOE VERA GEL AS EDIBLE COATING ON POSTHARVEST ACTIVITIES OF FRUITS

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Abstract: Postharvest activity is a key factor that affects the loss of nutritional and quality of fruits which consequently led to agricultural wastage. Therefore, edible coating from polysaccharide-based is widely used to overcome this issue as they act as protective barrier on the fruit's surface against microbial, enzymatic and chemical spoilage. Hence, aloe vera gel (AG) is extensively used as edible coating to provide an optimum preservation effect of fruits. So far, there has been little discussion about the studies of functional properties of AG. This review aims to describe the effectiveness of AG as edible fruits coating concerning the protective barrier and antioxidant agent against the postharvest activity. The findings from this review unveil that the good coating properties of AG is due to the glucomannans that can act both as gel (barrier) and antioxidant agent. On the other side, this study also bring to light regarding the potential toxicity by anthraquinone (aloe-emodin) compound in AG on human health.

1. Introduction

Fruit is known to be a high-demand food due to its practical value and importance in agro-industry (Kuyu & Tola, 2018). The increased demand for fruit is related to the excellent nutrient contents such as minerals, vitamins and fibre (Pareek, 2016). However, the fruit has to face some circumstances in the economic field due to the short shelf life that is affected by several factors such as chemical reactions, microbial infections and physical forces. The factor to be highlighted in this study is due to metabolic and enzymatic activities (chemical reactions) which alter the carbohydrate content, colour, appearance, texture, aroma volatiles, phenolic compounds and organic acid (M. Ibrahim et al., 2017; Tripathi et al., 2016). All these changes indicate that the fruits entering the ripening phase and ready to be harvested and acceptable for consumption. However, under circumstances, it will lead to the reduction of postharvest quality. Therefore, natural edible coating from aloe vera gel (AG) is recommended to apply in order to preserve the postharvest quality longer and slower the metabolic reactions. This study will be beneficial to the consumer and fruit supplier as the coating from AG is edible, non-toxic, less harmful than chemical preservatives and able to reduce wastage (Passafiume et al., 2020). Hence, this review described the functional properties of AG on their property as a barrier and antioxidant agent as well as potential toxicity.

2. Discussion

AG has been studied for its edible coating properties recently for several years. It has been classified as polysaccharide based edible coating. This type of edible coating is good as it brings various characteristics such as perform as a barrier toward gases (oxygen and carbon dioxide) as well as provide a strength for structural integrity on the fruits preserved (Desobry & Arab-Tehrany, 2014). Glucomannans is the main polysaccharide that can be found at the center of aloe vera leaves. Glucomannans is a polymer of glucose and mannose that responsible for the plasticity of the gel which forms as film. Basically, the high amount of water storage in the gel is responsible by mannan. This mannan also can be partially acetylated which later turns to acemannan. The beneficial effects of acemannan's acetyl and hydroxyl groups are shown to have free radical scavenging properties, as well as chelating features and be able to reduce against iron ions (Nicolau-Lapeña et al., 2021). Therefore, AG is good as it can provide both good barrier properties also as an antioxidant agent.

Several studies have shown that aloe vera edible coating is helpful in maintaining firmness and phenolic compounds of the coated fruits. The firmness eventually related to the increasing value of TSS during ripening. During the escalation of TSS value, most of polysaccharide are converted into simple sugar including pectin (cell wall polysaccharide). The analysis of firmness has been reported, where the papaya that has been coated using 30% AG showed only 35.8% loss of the firmness while the control has lost until 78.3% of firmness after 12 days of storage (Farina et al., 2020). Therefore, the coated papaya had lower TSS value and slow ripening process than the control which maintained the firmness. According Chrysargyris et al. (2016) and Mirshekari et al. (2019), the highest concentration of AG contributed to the highest number of phenolic, flavonoid and antioxidant content. Therefore, as the concentration increased, the antioxidant activity increased. A study by Hassanpour (2015) has reported that AG with concentration 50 and 75% possessed the highest amount of phenolic compound and antioxidant capacity after 8 days of storage under cold temperature rather than 25% AG and control sample that were gained slightly lower amount in that analysis. This showed that 50 and 75% AG able to elevate, preserve and slower the reduction of active compounds in the raspberry.

Recent studies have identified an uncontrolled amount and improper of consumption manner of AG anthraquinones can lead to adverse health issue for human body (Guo & Mei, 2016; A. Ibrahim et al., 2019; Liu et al., 2020). A study by Liu et al. (2020) had performed an in vitro cytotoxicity analysis of AG anthraquinones in concerning of liver toxicity in humans. This paper claims that an active compound named aloe-emodin in AG can give toxicity effects and eventually affected liver. However, the issues emerging from this finding of toxicity is related specifically to the high dosage of the anthraquinone (aloe-emodin) with prolong usage which has been determined the unfavorable effects toward human health (Guo & Mei, 2016). The prolong consumption might show an initial symptom before it goes into severe stage such as diarrhea, abdominal pain, vomiting and even worse it could lead to colon cancer or kidney failure.

3. Conclusion

To sum up, AG is a good candidate to apply as edible coating on preservation of postharvest fruits due to the main polysaccharide (glucomannans) and other active compounds that can bring good properties as edible film and antioxidant agent. Despite of all these functional properties, the potential of toxicity from both AGs can be controlled by following the estimated daily intake that

has been approved by authorizes/government as well as by ensuring to perform a proper usage method (consumption/application on skin or surface).

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