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Development of Aloevera Based Edible Coating

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ABSTRACT

Edible coatings are traditionally used to improve food appearance and conservation due to their environmentally friendly nature, because they are obtained from both animal and vegetable products. The shelf life of the guava is increased by a week by using edible coating under normal room condition but it is found that the shelf life can be increased by about one month in refrigerated conditions. The shelf life extension is due to the fact that edible coating prevents the microbial growth since it has antimicrobial activity. The fresh cut potato and apple doesn't undergo browning in normal conditions when it is coated. The optimum pH for browning is about 5-7 since the pH of the coating solution is about 4. The Browning is prevented rather than that the browning occurs when the enzymes like catechin, cholorogenic acids comes in contact with the atmospheric oxygen and converted into melanin a brown pigment.

Keywords: *Enzymatic browning, Catechin, Chlorogenic acid, Polysaccharides*

INTRODUCTION

Aloe Vera is a Succulent plant species, well-known plant for its marvelous medicinal properties have rejuvenating, healing or soothing properties. The gel is tasteless, colorless and odorless. This natural product is a safe and environmentally friendly alternative to synthetic preservatives such as sulfur dioxide[8]. Edible coatings are thin layers of edible material applied to the product surface in addition to or as a replacement for natural protective waxy coatings and provide a barrier to moisture, oxygen and solute movement for the food[6]. They are applied directly on the food surface by dipping, spraying or brushing[3]. Edible coatings are used to create a modified atmosphere and to reduce weight loss during transport and storage[2]. *Aloe Vera* is a plant made up of many complex ingredients including polysaccharides, glycoprotein, phenol compounds, salicylic acid, lignin, hormones, amino acids, vitamins, and enzymes which give *Aloe Vera* many beneficial properties.

Aloe Vera gel based edible coatings have been shown to prevent loss of moisture and firmness, control respiratory rate and maturation development, delay oxidative browning and reduce microorganism proliferation in fruits.

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It has antifungal and antibacterial property which provides a defensive barrier against microbial contamination of fruits and vegetables[14]. The main goal was to prepare *Aloe Vera* gel coatings as an effective preservative to improve the safety, quality and functionality of fresh fruits and vegetables[1].

The objectives of the present study are:

To extend the shelf life of Guava fruit by using *Aloe Vera* based edible coating solution

- To prevent enzymatic browning on coated fruits and vegetables

MATERIALS AND METHODS

Sample preparation

Fresh aloe Vera was collected. It is then washed with the chlorine water to remove the dirt and sensitive pathogens then washed in the running water and kept for drying. The aloe vera is cut along the sides using knife and the gel matrix is removed and collected in a bowl (the bowl used was cleaned and rinsed with hot water). The gel matrix thus obtained is stored in the refrigerated condition if it is used later[9].

Preparation of aloe vera edible coating solution

The gel matrix obtained is thoroughly mixed to obtain aloe vera juice. About 100ml of the juice is taken and kept for boiling. The juice was boiled in the beaker for about 75°C for 45minutes.During boiling add about 1% gelling solution and thoroughly mixed. After the boiling the mixture is rapidly cooled[4].

Fig. 1: Aloe vera edible coating solution

Compositional Analysis of Raw Guava

TSS: The guava juice was prepared and the juice was placed on the refractometer and the TSS count was measured.

Acidity: The titrable acidity was measured by taking 75ml of boiling water and add 10ml of guava solution to it. Take 0.1N NaOH in the burette and titrate against the mixture using phenolphthalein indicator. The end point is measured by getting a pink colour[12].

Moisture Content: The moisture content is measured by taking 5g of the sample weighted in a dried petri dish. The sample was placed in the hot air oven at the temperature of about 101°C.The sample was withdrawn at every 1hour and the weight is measured. If the weight becomes equal at regular intervals, the weight at that stage is taken and the moisture content is calculated[13].

Ash Content: About 10g of the sample was taken and char it in the cruicible. After charring the crucible is placed in the muffle furnace at the temperature of about 300°C for 3h and the weight is measured and the ash content is analyzed[11].

Fungal Growth: Coated guava was stored at ambient condition and fungal growth was noted in the consecutive days.

Coating of Raw Guava

The guava was cleaned in the running water to remove the impurities and is rubbed using a dry cleaned cloth. After cleaning the guava is coated with aloe vera solution by dipping. The coated guava was then kept for drying at room temperature and dried in the tray drier for 1h at 60°C[10] .

Compositional analysis of Coated Guava

Coated guava was analyzed for moisture content, TSS, titrable acidity and ash content. The same procedure as mentioned above was used for the analysis.

Estimation of weight loss

The weight of the samples was measured in the consecutive days (for about 5days) and graph was plotted considering weight loss against the days.

Studies on enzymatic browning

Prepare 100g of the vegetable sample. The sample is then cleaned. Boil about 400 ml of water in a beaker and add the prepared vegetables. Start counting when it is boiling again. After every 0,30,60,90,120 and 150 s remove some vegetables and allow it to cool. Grind it and check for the presence of enzymes especially catalase and peroxidase[7].

RESULTS AND DISCUSSION

Titratable Acidity (TA) is a measure of the amount of acid present in a solution. It is expressed as grams/litre (g/L) and is obtained by multiplying to percent TA by 10. So, a TA of 0.60% is expressed as 6g/L. pH is defined as the measure of the strength of acid in a solution. Moisture content is the quantity of water contained in a material, such as soil (called soil moisture), rock, ceramics, and fruit. Ash refers to any inorganic material, such as minerals, present in food. It's called ash because it's residue that remains after heating removes water and organic material such as fat and protein. Ash can include both compounds with essential minerals, such as calcium and potassium, and toxic materials, such as mercury. Generally, any natural food will be less than 5 percent in ash content, while some processed foods can have ash content of more than 10 percent

Table 1: Compositional Analysis of Raw Guava

Properties	Values
Titratable acidity (%)	0.73
Moisture content (%)	84.4
Ash content (%)	0.45

Table 2: Compositional Analysis of Coated Guava

Properties	Day 1	Day 4
TSS (° brix)	66.0	65.3
Acidity (%)	0.75	0.78
Moisture content (%)	83.3	82.2
Fungal growth	Not visible	Not visible
Ash content (%)	0.45	0.47

Table 3: Compositional Analysis of Uncoated Guava

Properties	Day 1	Day 4
TSS (°brix)	63.6	61.2
Acidity (%)	0.76	0.84
Moisture content (%)	82.8	79.8
Fungal growth	Not visible	Spoiled
Ash content (%)	0.45	0.42

The Total solid content for coated guava is about 65.3 and uncoated about 61.2 (with a net difference of 0.7 in coated and 2.4 for uncoated) indicates that TSS doesn't undergo any noticeable alteration. A higher value of TSS is related to greater sweetness and superior eating quality of a fruit. The general value for TSS of guava is around 66. 8ºBrix.Thus we can conclude that by edible coating the Sweetness and quality of the fruit can be improved. The acidity as compared with coated and uncoated has the same effect as the TSS effects the ripening of fruit.

In uncoated guava, carbohydrates are hydrolyzed into sugars increasing osmotic transfer of moisture from peel to pulp. The observed decrease in moisture content of the guava was therefore expected. Water is an important solvent for many soluble substances such as salts, sugars that are known to influence taste in fruits[5]. The net decrease in moisture content of the coated guava (1.1%) compared to that of uncoated (3%) enhanced the taste and aroma of the fruits as shown by the strong positive correlations between moisture content and taste as well as aroma.

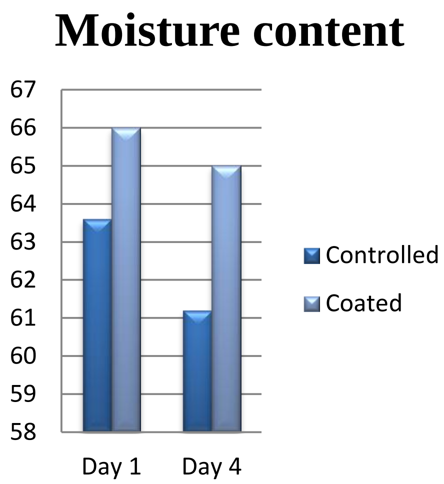

Fig. 2:

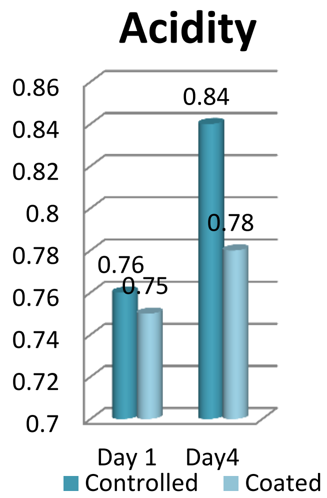

Fig. 3:

The graph (Fig.2 and 3) above shows the comparison of coated and uncoated guava with respect to moisture content and acidity. The variations can be clearly stated using the graph indicating that the value of coated is much higher in case of moisture content implies the quality and ripeness of the fruit is greater in coated and acidity implies the effectiveness of sweetness and quality of guava.

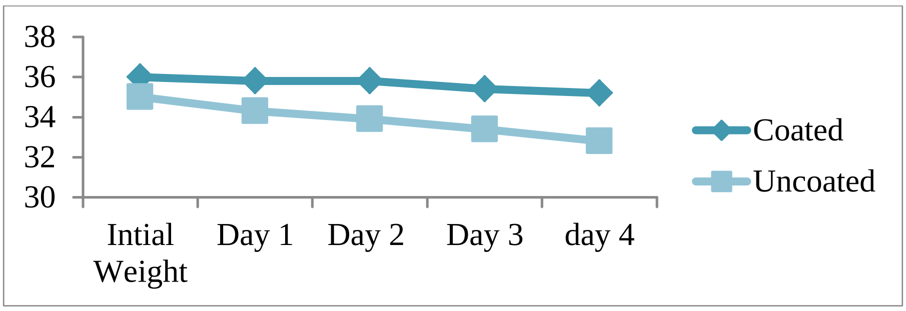

Fig 4:Weight loss of aloevera coated guava

By analyzing the graph, it is clearly visible that weight loss due to moisture content loss in coated guava is much lesser than that of uncoated indicating that the quality remains much better for coated. The initial weight of the coated is about 36g and the final weight is about 35.6g a net weight loss of 0.4g is seen while in case of uncoated the initial weight is 35g and the final weight we observed is 32.7g indicating a net loss of 2.3g in four days. Thus the analysis came with the conclusion that the weight remains almost unaltered in coated thereby maintain quality and texture of the fruit.

Enzymatic browning

Enzymatic browning is a chemical process, involving polyphenol oxidase, oxidase and other enzymes that create melanin's and benzoquinone from natural phenols, resulting in a brown color. In general, enzymatic browning requires exposure to oxygen, for example the browning that occurs when an apple is cut. So with the help of aloe vera edible coating the action of the enzymatic browning was prevented. The enzymatic browning of coated and uncoated potato, banana and apple was studied. The major enzymes that is responsible for browning are peroxidase and catalase. The main aim was to inactivate these enzymes; the inactivation is done by blanching a minimal heat treatment. The efficiency of blanching depends upon the activation of these enzymes.

Table 1: For uncoated samples

Enzymes	**sample**	**0 sec**	**30 sec**	**60 sec**	**90 sec**	**120 sec**
catalase	potato	+	+	+	-	-
	apple	+	+	+	+	-
enzymes	sample	0 sec	30 sec	60 sec	90 sec	120 sec
peroxidase	potato	+	-	-	-	-
	apple	+	+	+	-	-

Table 2: For coated products

Enzymes	**sample**	**0sec**	**30sec**	**60sec**	**90sec**	**120sec**
catalase	Potato	-	-	-	-	-
	apple	-	-	-	-	-
Enzymes	sample	0sec	30sec	60sec	90sec	120sec
peroxidase	Potato	-	-	-	-	-
	apples	-	-	-	-	-

By comparing the above tables + indicates the presence of enzyme while – indicates the absence of enzyme. By analyzing the tables, we can find that the enzymes (both peroxidase and catalase) are absent in coated samples indicating the absence of browning but the enzymes are active in the uncoated produces indicating that it will undergo browning in prolong storage.

Table 3: For raw products

Enzymes	**Sample**	**0 sec**	**30 sec**	**60 sec**	**90 sec**	**120 sec**
Catalase	Potato	+	+	+	+	-
	apple	+	+			
Enzymes	sample	0 sec	30sec	60 sec	90 sec	120 sec
peroxidase	Potato	+	+	+	-	-
	apple	+	+	+	+	-

Table 4: For coated products

enzymes	**sample**	**0sec**	**30 sec**	**60 sec**	**90 sec**	**120sec**
catalase	Potato	+	-	-	-	-
	apple	+	+	-	-	-
Enzymes	Sample	0sec	30 sec	60 sec	90sec	120 sec
peroxidase	Potato	+	-	-	-	-
	apple	+	+	+	-	-

By comparing the above tables + indicates the presence of enzyme while – indicates the absence of enzyme. By analyzing the tables, we can find that the enzymes (both peroxidase and catalase) is present and the effective blanching time is found to be 60sec for apple and 30sec for guava both coated means there will be browning but it will be delayed as compared with the raw samples.

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