EDIBLE FILM COATING OF FRESH CUT PAPAYA

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ABSTRACT

Papaya (Carica papaya L.) provides several vitamins, particularly of B-group, several anti-oxidant molecules such as flavonoids, carotenes and vitamin-C as well as foliates; trace minerals, pantothenic acid, potassium, magnesium and dietary fiber. Papaya flesh is very high in vitamin A. Edible packaging films can be eaten together with packaged food and also environmental friendly. Aloevera, Sodium Alginate and Pectin coatings was given to papaya fresh cuts. Aloevera gel retarded the ripening process and an effective physical barrier, thus reduces weight loss during storage. Aloevera gel delayed softening and maintained quality. Treatment with Aloevera increased the appearance and colour of the papaya cut fruits. The moisture loss was 15%, weight loss was 0.04% in aloevera treated papaya cut fruits. The decrease in pH was 6.8% and increase in TSS was 4% in aloevera treated papaya cuts. Hence the properties like moisture loss and weight loss was reduced, pH and TSS was also maintained when compared to other two coatings and control. So, it is observed that Aloevera was best suited for the coating of Papaya than the other 2 coatings i.e., Sodium alginate and Pectin.

Keywords: Edible coating, Papaya, Aloevera, Sodium Alginate, Pectin.

Introduction

Edible film is defined as a membrane, which is formed by interacting between different molecules and come from nature and edible material such as polysaccharide, protein etc., Edible packaging films can be eaten together with packaged food. The goal is to maintain barrier for some period of time, in the same way that an inedible package might. (Sidhu et al, 2006). While conventional food processing methods extend the shelf life of fruits and vegetables, minimal processing may render them highly perishable, requiring refrigerated storage to ensure a reasonable shelf life (Garica and Barrett, 2002. Three coatings were tested, namely, Aloevera gel, Sodium Alginate and Pectin. Aloevera acts as the healthy preservative coating and thus will preserve the quality and safety of fruits during cold storage. This study was done on papaya that resulted in its subsequent increase in shelf life. The gel also offers protection from some of the dangerous pathogens by inhibiting their growth, and it also provides numerous health benefits (Sharma et al., 2013). Pectin reduces color degradation, texture softening, weight loss, carbon dioxide evolution and acid production in fruit like mango (Moalemiyan et al., 2011). Alginate coating has the potential of increasing shelf life and maintaining the freshness in fresh cut fruits.
(Azarakhsh et al., 2012). The present study is taken up with the objectives to evaluate the best edible film among the 3 films i.e., Aloevera gel, Pectin coating and Alginate coating and to study the shelf life of the edible film coated papaya cuts.

Material and methods:

Procurement of raw materials Papaya was procured from the local market in Bapatla. Aloevera leaves are procured from the local market in Bapatla. Sodium alginate, chitosan, ascorbic acid, calcium chloride, glycerol were procured from National Scientific Products, Guntur.

Aloevera gel coating Matured leaves of Aloevera plant was harvested and washed with a mild chlorine solution of 25%. Aloevera gel matrix was then separated from the outer cortex of leave and blended and fresh gel was obtained. The gel matrix was pasteurized at 70°C for 45min. For stabilized the gel was cooled immediately to an ambient temperature and ascorbic acid (1.9 - 2.0g/L) was then added citric acid (4.5 - 4.6g/L) was added to maintain the pH at 4. It was later be stored in brown Amber bottle to prevent oxidation of the gel. Then dip the papaya cut fruits in the solution and then dry the cut fruits.

Preparation of pectin coating Dissolve the pectin powder in distilled. Filter the solution to remove undissolved particles. Add some amount of calcium chloride in order to main pH of the coating solution. After the preparation of coating dip the papayas cut fruits in pectin solution and then dry the cut fruits.

Preparation of Sodium alginate coating Sodium alginate powder was dissolved in distilled water by heating on a hot plate at 70°C and Glycerol is added to the solution. The sun flower oil (0.25% w/v) was used in edible coating. Solutions are mixed with homogenizer for 5 min at 24500 rpm. 2 % of calcium chloride solution also added. Dip the cut fruits in prepared solution and dry. After coating the fruit cuts were packed and stored in refrigerator.

Organoleptic evaluation
Sensory evaluation of control papaya cut fruits, aloevera coated, sodium alginate coated, pectin coated papaya cut fruits was conducted on different parameters like colour, taste, appearance, flavour and overall acceptability. These samples were tested with the help of 10 member panel. Samples were tested for different parameters like colour, taste, appearance, flavour and overall acceptability. (Hedonic 9 point scale by Periyam). The results were presented in the following Table 1.

| Table 1. Sensory evaluation table for the papaya cut fruits |
|-------------------|----------------|----------------|------------|-----------------|----------------|
|                   | Appearance | Colour | Flavour | Taste | overall accept ability |
| Control           | 7.2        | 7.4    | 7.8     | 7.4   | 7.3               |
| Aloevera          | 8.2        | 8.0    | 7.4     | 7.4   | 7.6               |
| Sodium Alginate   | 7.8        | 7.6    | 7.2     | 7.6   | 7.8               |
| Pectin            | 7.6        | 7.7    | 7.5     | 7.5   | 7.7               |
From the Table 1, it is seen that in terms of colour and appearance papaya cut fruits coated with Aloevera is rated as best. In terms of flavour papaya cut fruits coated with pectin is rated as the best. In terms of taste and overall acceptability the papaya cut fruits coated with sodium alginate scored highest. Hence, appearance and colour is highest in aloevera coated papaya cuts, whereas taste and overall acceptability was highest in sodium alginate coated cuts and flavour scored best in control sample.

**Proximate analysis** Results obtained after proximate analysis of the coated and control papaya cut fruits are following:

**Moisture content** Analysis of Moisture content was done by oven method (ISI 0484.1983 specifications). The moisture content of the control sample was found to be 25%, for aloevera coated sample it was 15%, sodium alginate coated sample was 20% and pectin coated was 22%. The moisture loss was recorded more in control sample (25%) when compared to the coated samples. In the coated samples the moisture loss is more in pectin (22%) then followed by sodium alginate (20%). Aloevera coated fruits exhibit good moisture barrier capacity as the moisture loss was only 15%. Valverde et al., (2005) reported Aloevera based edible coatings have been shown to prevent loss of moisture.

**Carbohydrates** Analysis of Carbohydrates was done by Anthrone method (AOAC, 1981). The carbohydrate content of the treated and untreated papaya cut fruits were shown in Table 4.3. The carbohydrate content of the control sample was 11 g, alovera treated sample was 11.534 g, sodium alginate treated sample was 11.35 g and pectin treated sample was 11.25 g. The carbohydrate content was found to be more in papaya cut fruits coated with alovera when compared to other two samples that is sodium alginate (11.35) and pectin (11.25) coating. The carbohydrate content of control sample is (11.00g) which was increased by these edible coatings.

**Analysis of Protein** Analysis of Proteins was done by Folin -lowry method (AOAC, 1990). The protein content of the untreated papaya sample was 0.5 g, alovera treated sample was 0.8 g, sodium alginate treated sample was 0.65 g and pectin treated sample was 0.59 g. The protein content was found more in alovera when compared to the control and other two coated samples i.e., sodium alginate and pectin coating. The protein content in control sample was (0.5 g) where as the protein content in alovera was (0.8 g) followed by sodium alginate (0.65 g) and pectin (0.59 g).

**Analysis of fat** Analysis of Fat was done by Soxhlet method. The fat content of the treated and untreated papaya cut fruits taken and were analysed for fat after 5days of treatment. The fat content of the untreated sample was 0.3 g, alovera treated sample was 0.2 g, sodium alginate treated sample is 0.3 g, aloevera treated sample was 0.2 g
and pectin treated sample is 0.1 g. The fat content is found to be maintained in papaya cut fruits coated with sodium alginate (0.3g) when compared to other two coatings i.e., pectin (0.1g) and aloevera (0.2g). The fat content of the control sample is 0.3g and is maintained by sodium alginate. Cottrel (1980) et al. reported that alginate coatings are impervious to oils and fats.

**Analysis of ash content**

Analysis of Ash content (AOAC, 1981). The ash content of the treated and untreated samples was recorded. The ash content of control sample was 0.6%, aloevera treated sample was 0.7%, sodium alginate treated sample was 0.9% and the pectin treated sample was 0.8%. The ash content was found to be more in sodium alginate coated papaya cut fruits followed by aloevera (0.7%) and pectin (0.8%) coated papaya cut fruits. The ash content of the control papaya cut fruits is 0.6%, whereas in sodium alginate it is 0.9%.

**Titratable Acidity**

Determination of Titratable acidity by AOAC (2000) method. From the Table 3.7., the titratable acidity was calculated for the control sample along with the three coated samples i.e., aloevera, sodium alginate and pectin for Day 1, Day 3, Day5 and Day 7. From the Fig.3.7, the increase in percentage of titratable acidity was found more in control sample (23%) followed by pectin (17%) and aloevera (10%). The sodium alginate coated papaya cut fruits shows the less increase of titratable acidity (9%).

**Estimation of Total soluble Solids**

Total soluble solids in papaya was estimated by (Dong 2001) method. The TSS of control and treated papaya cut fruits was determined on every alternate day up to 7 days. From the Fig 3.8, the percentage increase of TSS is found to be more in control sample i.e., 12% followed by pectin with 7% and sodium alginate with 6.9%. The percentage increase of TSS in aloevera coated papaya cut fruits is 6.8%.

**Acidity**

The Acidity of edible film coated fresh cut papaya fruit were estimated by AOAC, 1990 method. Acidity was increased in control sample when compared to the aloevera, sodium alginate and pectin coated cut fruits. From the Fig 3.9, the increase in acidity of control papaya cut fruits is 20% whereas the aloevera coated cut fruits is 4% and the sodium alginate coating is 12 %. Hence the increase in acidity is less in aloevera coated papaya cut fruits.

**Estimation of Beta carotene**

β- Carotene of fresh cut edible film coated and uncoated papaya was estimated (Ranganna, 1986) for seven days. The β carotene was found to be increased in aloevera coated papaya cut fruits and then followed by pectin and sodium alginate coatings. The β carotene content was found to be increased in the coated samples when compared to the control ones (0.04%). It was highest in aloevera. Minimal
change is only observed. 0.11% in aloevera coated papaya cut fruits followed by pectin (0.06%) and sodium alginate (0.05%).

Weight loss
The weight loss of the untreated and treated papaya cut fruits were recorded for seven days on the Day 1, Day 3, Day 5 and Day 7. It is known that the weight loss is more in control sample in 7 days there is weight loss of 30g. The weight loss in aloevera coated sample is only 4g and then followed by pectin 7.4g. The sodium alginate coated sample weight loss is 10.5g. It can be concluded that with in the 3 coatings aloevera, sodium alginate and pectin sodium alginate is the poor barrier of moisture content and hence there is more weight loss.

Microbial Analysis
Microbial Analysis was carried out according to AOAC, 1926. From Tab.3.12, the bacterial and fungal count of the treated and untreated samples was known. Both bacterial count and fungal count was found to be less in aloevera coated papaya cut fruits when compared to the control sample. Davis (1997) reported that aloevera is bactericidal against a variety of common wound infecting bacteria. Adetunji, (2008) reported that the Aloevera extracts possessed anti-microbial activity against bacterial pathogens.

Conclusions
It was found that the aloevera, alginate and pectin film coated fresh cut papaya fruit can be stored for seven days. Among the three edible film tested, alovera performed best in terms of antimicrobial, antifungal and organoleptic evaluation. Also it was found to be better with moisture barrier properties.

References

