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EDIBLE FILM COATING OF FRESH CUT JACK FRUIT

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Abstract: Jackfruit (*Artopus heterophyllus)* is an important fruit crop grown in india and also is second largest producing country in the world. The desiccation of fruits and perishable nature of jackfruit is major drawback for the transportation to distant markets and storage during glut in the market. Extention of shelflife of jackfruits continues to be a challenge in india. The search for safe, healthy and environmental riendly treatments has led to increased intrest in research in to edible and biodegradable films and coatings. The aim of the study was to evaluate the effect of different coatings as an edible coatings on weightloss, ascorbicacid and pH in order to extend the shelflife. The above parameters which are related to post harvest quality loss were however significantly controlled in the different coated fresh cut jackfruit (alovera) the storability of fesh cut jackfrutswas extended by sevendays. It was found that Alovera gel is best coating for jack fruit could serve as alternative to post-harest chemicals treatments.
Keywords: Edible film, jackfruit, Aloveragelcoating.

2.0 Introduction

Jackfruit (Artocarpus heterophyllus), India-second largest producer-"motherland of jackfruit" Largest Fruit in the world. It has wide distribution in Assam, Tripura, Bihar, Uttar Pradesh, the foot hills of the Himalayas and South Indian States of Kerala, Tamil Nadu and Karnataka. Jackfruit processing has improved during the last few years. Prospective market products - India as well as outside the country. Thorns & big size -inconvenient to carry and consume. Highly perishable because of its inherent compositional and textural characteristics. It has high commercial value. The edible film coatings are films that improve product quality and can be safely eaten as part of the product and do not add unfavourable properties to the food stuff (Baldwin, 1944; hvenainen, 1966). In every year (glut season (june-july)) -wastage- lack of proper post harvest knowledge. To extend the shelf life, edible coating is one of promising methods because of its particular properties (moisture loss, aroma loss & respiration). In addition, edible coating is convenient and conforms to food safety. Edible coatings provide a barrier against external elements and therefore increase shelf life (Guilbert et al., 1996) by

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reducing gas exchange, loss of water, flavor and aroma and solute migration towards the cuticle (Saltveit, 2001). The mainly used coating to extend the shelf life is alovera coating.

The present study is taking up with the following objectives:

To study the shelf life of the edible film coated on jack fruit bulbs. To evaluate the best edible film which is suitable for coating on jack fruit bulbs among the three films (alovera gel, pectin, alginate) was studied.

3.0 Materials and methods:

3.1 PREPARATION OF JACK FRUIT BULB CUTS

The seed is separated from the jack fruit bulbs and bulbs are cut into suitable size. The jack fruit bulbs pieces are coated with three types of edible film coatings. Alovera gel coating, Pectin coating.

3.2 Preparation of Aloevera Gel Coating:

Matured leaves of alovera 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 this colourless hydro parenchyma was ground in a blender. The resulting mixture was filtered to remove the fibres. The liquid obtained constituted fresh alovera gel. 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. The viscosity of the stabilized Aloe Vera gel and it coating efficiency was improved by using 1% commercial gelling agent and was used as coating agent. It was later stored in brown Amber bottle to prevent oxidation of the gel. Then dip the jackfruit bulb cuts in the solution and then dry the bulbs.

3.3 Pectin Coating:

Dissolve the pectin powder in distilled water. Filter the solution to remove undissolved particles. Add some amount of calcium chloride in order to maintain pH of the coating solution. After the preparation of coating dip Jackfruit cut bulbs in pectin solution and then dry the cut bulbs.

3.4 Evaluation on Edible Coating

The fresh cut bulbs of jack fruit were separately examined with and without coating with following methods. Organoleptic evaluation, Proximate analysis, Microbial analysis, Statistical analysis.

4.1 Organoleptic Evaluation:

The sensory evaluation was conducted in sensory evaluation laboratory, department of food technology. The panellists were selected solely on the basis of interest, time available and lack of allergies to food ingredient used in study.

Samples were tested for different parameters like colour, taste, consistency, appearance, texture, flavour and overall acceptability which the consumer can evaluate with his senses. All these tests including testing for consumer acceptance was done by sensory panellist according to 9 point hedonic scale for sensory evaluation as described by Peryac and Giradot (1952).

1. Color: It Is Done By Mainly 2 Methods, Subjective Method-sensory Evaluation, Objective Method-Hunter Color Lab, Appearance, Taste and Flavor, Overall Acceptability.

4.2 PROXIMATE ANALYSIS:

1. Moisture Content- Oven Drying Method (ISIO484.1983) specifications

2. Carbohydrate- Anthrone Method (AOAC,1990)

3. Energy-By Bomb Colorimeter (ranganna.1986)

4. Protein-Folin –Lowry Method (ranganna,1986)

5. Fat-Soxhlet Method

6. ASH-By Muffle Furnace

7. IRON-AOAC(2005)

8. CALCIUM-Titration Method

9. PHOSPHORUS –Colorimetry Method

10. VITAMIN A-Ranganna(1986)

11. VITAMIN C-Ranganna(1986)

12. TOTAL SOLUBLE SOLIDS-BY REFRACTOMETER (DUNG.(2001)

13. TITRATABLE ACIDITY - AOAC(2000)

14. ACIDITY OR pH-pH paper

4.3 MICROBIAL ANALYSIS:

The microbiological analysis was conducted by Microbial limit test (MLT) (AOAC-966.23c).

4.4 STATISTICAL ANALYSIS: Statistical analysis is done by the method of completely randomized design method (CRD). Microsoft Excel used for the calculation and data analysis of the CRD.

4.4.1 Results and discussion:

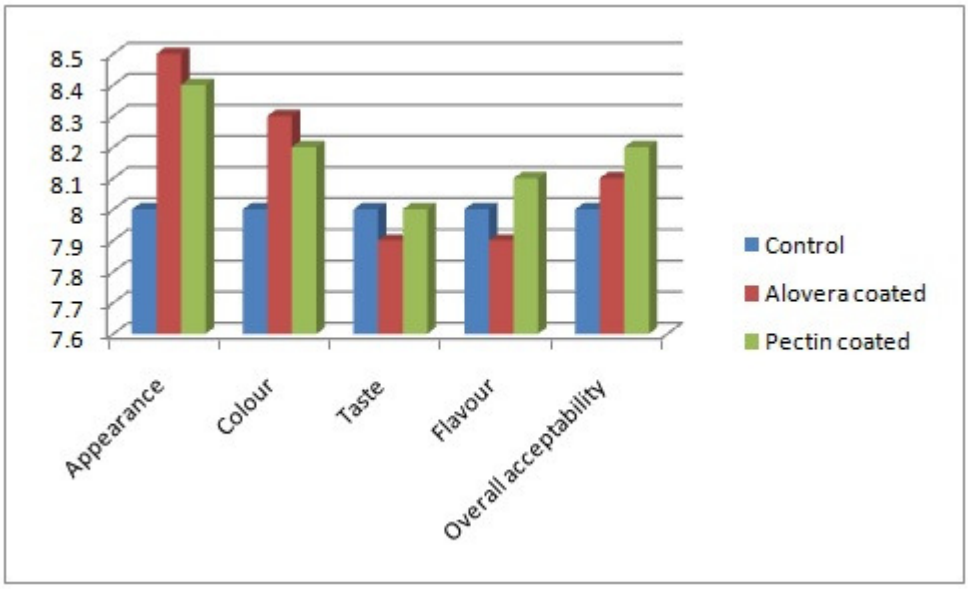

Fig 4.4.1 SENSORY EVALUATION CHART

Sensory evaluation is to compare the quality of treated and control jack fruit bulbs were carried out by 9 point hedonic scale which contains 9 members as panellist. The results obtained after sensory evaluation of treated and control fresh cut bulbs are compiled in bar diagram. In the sensory analysis data the pectin coated sample showed highest overall acceptability of 8.2 hedonic points where as the control showed lowest overall acceptability of 8 hedonic points. The pectin coated samples have a higher hedonic rating of 8.2 but alovera coated sample scored only 8.1 hedonic points. These scores are illustrated in the bar graph below in Fig 3.1. The data showed a small difference in overall acceptability of treated and control samples. Though the difference in overall acceptability among treated samples are negligible. Thus the treated samples are at far with the control in overall acceptability. The sensory properties of an edible film or coating are a key factor for acceptance of final products (Chen, 1995).

Weight Loss/ Gloss during Storage of Control, Alovera Coated and Pectin Coated Samples

The weight loss of fresh cut bulbs with coating and without coating was determined using analytical weighing balance. The weight loss during storage estimated and presented the data in Table 4.3. The first day the all samples are taken as 100 gm and kept for storage. The second day the alovera coated sample showed less decrease in weight of 98.2 g where control has high weight of 96 g. The third day also alovera coated sample showed a less weight of 96.5 g where the control has great decrease of 95.5 g. The fourth day alovera coated sample

showed weight of 95.5 g where control has less weight of 95.5 g. The fifth day again alovera coated sample has weight of 95 g where control has 89.5 g. The sixth day alovera coated sample weight is 94.6 g where control has 87.5 g. The seventh day alovera coated sample has 94 g where control has 86.2 g.

It means the control shows a higher value of decrease in its weight. The more weight loss of control (13.8%) due to respiration as well as the release of water content from the sample. According to Amaranth *et al* (2001), weight loss is caused by respiratory loss and evaporation of water from the fruit. But in the case of coated samples has lower weight loss and very minute release of water in the surface during storage. It is because of the coating which can protect the surface and as well as it can act as a barrier from environment.

In the coated samples, the alovera coating shows the less weight loss of 6% where as pectin coated sample (10.8%) and alginate coated sample (7.1%) shown high weight loss. Among the coatings investigated, alovera coating shown superior moisture barrier properties and alginate shown inferior. From this data reveals alovera is a suitable coating for preventing moisture loss and also alginate coating is poor moisture barrier. Similar results were reported by Juan *et al.* (2005) on grapes that alovera gel prevented moisture loss and control respiratory exchange. But in the case of alginate coating, it was recorded that moisture barrier property was inferior. According to Cottrel *et al* (1980), Alginate coatings were impervious to oils and fats but have poor moisture barrier. According Bari *et al.* (2002), Weight loss can cause flesh softening, fruit ripening and senescence by ethylene production and other metabolic reactions. It means the quality of the fruit depend upon the weight loss. Therefore less weight loss during storage causes increase the quality. Therefore, the alovera coated sample is the best coating with lower weight loss in jackfruit bulbs.

The coated samples were stored under refrigerated conditions about 6oC and observed the weight loss up to 7 days. At the end of seventh day, the bulbs were found to be unfit for consumption. It means the coated samples were able to increase their shelf life up to 7 days.

The following table represents weight loss of fresh cut jack fruit

Days	**Control**	**Alovera Coated**	**Pectin Coated**
1	100	100	100
2	96.0	98.2	97.4
3	95.5	96.5	96.0
4	91.5	95.5	94.9
5	89.1	95.0	94.1
6	87.5	94.6	93.2
7	86.0	94.2	92.9

Changes in Ascorbic Acid Content during Storage

The ascorbic content of fresh cut bulbs with coating and without coating is evaluated during storage of 7 days. The data is given in the Table 4.4. The 2 day of storage, alovera coated sample has higher amount of ascorbic acid of 73.33 ug. the control has lesser content of ascorbic acid of 69.33 *u*g. The 4 day the alovera coated sample reduced to72 *u*g and control also reduced to 65.33 *u*g and also the alovera coated sample only contain more amount of ascorbic acid. the 6 day of storage the alovera coated sample reduced to 69.*33ug* and control reduced to 62.*66ug* .The alovera coated sample shows a high amount of ascorbic acid in every day of storage even it has a minute loss.

The alovera coated sample has lower loss of (5.45%) compared with other samples. The alginate and pectin coated samples also have loss of 6%, 5.5% respectively but these samples have less loss when compared with control loss (9.62%). Among all alovera coated sample has very less amount of ascorbic acid loss. According to Adetunji *et al.,* (2012), Alovera gel coating was effective in reducing ascorbic acid loss. The high amount of ascorbic acid content help to increase nutritional value and also help to increase the shelf life of coated sample over control sample.

4.5 Proximate Analysis

Results obtained of proximate analysis of aloevera coated, alginate coated, pectin coated samples over control of fresh cut jackfruit bulbs are following.

parameter	CONTROL	ALOVERA COATING	PECTIN COATING
MOISTURE(%)	71.6	59.2	76.4
CHO ,%	16	18	60
ENERGY, cal/g	850	895	890
protein ,g	1.7	1.8	1.76
fat ,g	0.6	0.59	0.58
ash ,%	14	15	14.5
iron ,mg	0.512	0.498	0.488
calcium ,mg	20.15	21.16	21.15
phosphorus ,mg	41.51	41.52	41.54
vit-A ,*u*g	319.71	319.93	319.65
vit-C ,*u*g	71.44	72.36	72.41
TSS ,%	20.4	19.9	20
PH	6	5	5

Table no 4.5 representation of proximate values

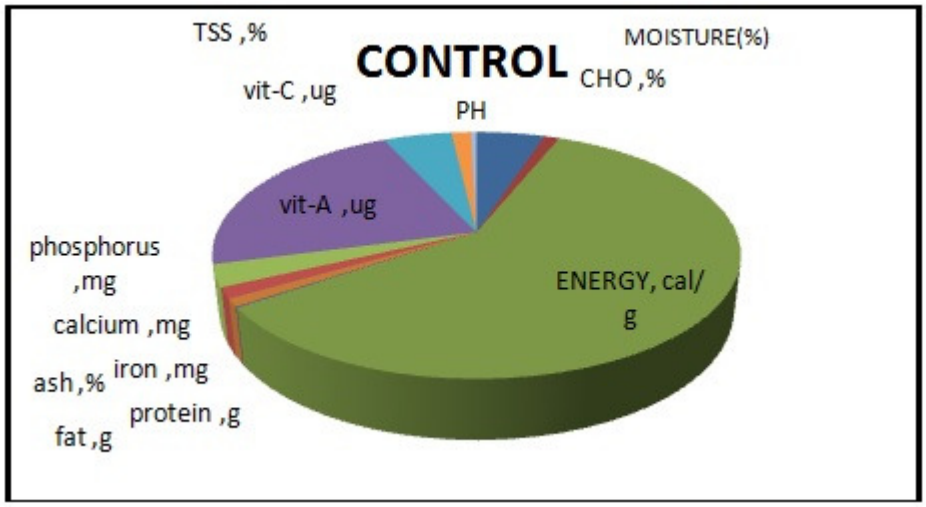

Fig 4.5 Pie chart representing proximate analysis

4.5.1 Estimation of Moisture Content

The total moisture content present in the samples is calculated by the method of oven drying. The data are analysed and kept in fig 4.5. The total moisture content is very lowest value of 59.2 % in alovera coated samples. The highest moisture content present in the value of 71.6% in the case of control. The higher moisture content causes high microbial spoilage. Therefore, the alovera coated sample has lower microbial spoilage and less amount of water activity when compared with control and other coated samples. The data is illustrated in pie diagram.

4.5.2 Estimation of Carbohydrate

The carbohydrate content was estimated by the anthrone method. The data is showing in the fig 4.5. The pectin coated sample has highest value of 60% of carbohydrate and control has only the value of 16%.The pectin coated samples have very high carbohydrate content compared with other samples. It is because they both are carbohydrate in nature. But in the case of alovera coated sample has higher value than control because alovera gel also contains a small amount of carbohydrate. The data illustrated in Fig 4.8. The higher the carbohydrate content helps to give more amount of energy during consumption.

4.5.3 Estimation of Total Energy

The total energy calculated by the method of bomb colorimeter. The data is given in the Table 4.5. The total energy was found to be highest value of 895 cal/g in alovera coated sample. The control has lowest value of 850 cal/g. The alovera coated sample shows more value because alovera gel has ability to provide energy so recently it is used for the preparations of energy drinks.

4.5.4 Estimation of Protein

The estimation of protein is done by Folin –Lowery method. The data is showed in the fig 4.5.the protein content was found to be highest value of 1.8 g in alovera coated fresh cut jackfruit bulb. Compared with control samples the coated samples have more protein content. The more protein content helps in increase the nutritional value.

4.5.5 Estimation of Fat

The fat content is estimated by soxhlet method. The data is showed in the Table 4.5. The lowest fat content of 0.58 g found in pectin coated sample. Comparatively yo control sample pectin has low fat content.

4.5.6 Estimation of Total Ash

The total ash content is measured by using muffle furnace. The data analysed and shown in fig 4.5 .the pectin coated sample has more ash content of 15% . The control has lower amount of ash content of 14%. Compare to control, coated sample have more amount of ash content.

4.5.7 Estimation of Iron

The Iron content is estimated by using AOAC (2005) method. The data is shown in Table 4.5. Pectin coated sample has lower iron content of 0.488 mg. Compared to control coated sample has more iron content.

4.5.8Estimation of Calcium

The pectin content is estimated. The calcium content was found highest value of 22.26 mg in alginate coated sample. The control has lowest value of 20.15 mg. Coated samples were compared to control, it have more calcium content.

4.5.9Estimation of Phosphorus

The total phosphorus is estimated by using colorimeter. The phosphorus content was higher value of 41.54mg in pectin coated sample. The control has lower value of 41.51 mg. Compared to control the coated samples have higher phosphorus content.

4.5.10 Estimation of Vitamin C

The vitamin C content is estimated by titration with the dye 2, 4 dichloride indol phenols. The data is showed in the Table. The vitamin C content found in highest value of 72.36 mg in alovera coated sample. The control has lowest value of 71.44 mg the vitamin C is higher amount in coated samples when it is compared with control sample.

4.5.11 Estimation of Vitamin A

The vitamin A content is estimated and the data is kept in table. The alovera coated sample has highest value of 319.93mg of vitamin A. The control has lowest value of 319.71 mg. The vitamin A is high amount in coated sample compared with control sample.

4.5.12 Estimation of Titratable Acidity

The titratable acidity is calculated by titration method. The data is shown in Table. The pectin coated sample has highest amount of 0.35% total acid and control has lowest amount of 0.1232% total acid. The total acid content is high in coated sample compared to control.

4.5.13Estimation of Total Soluble Solids

The TSS is estimated by the use of refractometer the data is shown in Table. The pectin coated sample has highest value of TSS of 20° brix. The alovera coated has lowest TSS of 19.9° brix.

4.5.14 Estimation of Acidity/pH

The pH is estimated by the use of pH paper. The data is shown in Table. The control and alovera coated has equal value of pH of 6. The alginate and pectin has equal value of 5. The low pH indicate the high amount of acid content.

5.0 CONCLUSION

The alovera coated sample gave less weight loss as well as less ascorbic acid loss during storage. In the proximate analysis, the alovera coated sample has lowest moisture content. The carbohydrate content high in pectin coated sample. The alovera coated sample gave high calorific value in energy determination. The highest protein content also present in alovera coated sample only. The vitamin C and vitamin A content is highest in alovera gel coated sample. The highest amount of titratable acidity also present in alovera gel coated sample only. In the microbial analysis, the alovera coated sample showed less amount of bacterial as well as fungal count. In the microbial analysis, the alovera coated sample showed less amount of bacterial as well as fungal count.

We concluded that among the three coating alovera coating is best coating for jackfruit because of its good moisture barrier and less amount of ascorbic acid as well as weight loss during storage and also high calorific value, high protein content, high vitamin A, high vitamin C content and also statistical analysis showed the high significant value.

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