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Research Article

COMPARISON OF EFFECT OF CARBOXYMETHYL CELLULOSE AND HONEY COATING ON FRESH CUT PAPAYA (*Carica papaya* L.) FRUIT

DEEPIKA KOHLI*[1], AYUSH BHANDARI[1], SANJAY KUMAR[2] AND RITESH MISHRA[3]
[1]Department of Food Technology, Uttaranchal University, Dehradun, 248007, Uttarakhand, India
[2]Department of Life Science, Graphic Era University, Dehradun, 248002, Uttarakhand, India
[3]Department of Agricultural Sciences and Engineering, IFTM University, Moradabad, 244001, Uttar Pradesh, India
*Corresponding Author: Email - deepikaprp27@gmail.com

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Abstract- The aim of the present study was to investigate the impact of edible coating on quality and shelf life of papaya fruit. Three samples were tested for quality attributes during storage: CMC (CarboxyMethyl Cellulose) along with a certain proportion of edible glycerol solution and honey. The quality was checked by including weight loss, TSS, pH, Ash content, titrable acidity, Ascorbic acid content (AAC) and microbial count in a regular basis for 11 days. On the passage of time CMC and honey showed best results as it reduced the transpiration rate as compared to controlled sample which starts fast spoilage as because no treatment was applied and the rate of loss of quality was very faster as compared to the other two coated samples.

Keywords Papaya, Edible Coating, CMC, Honey, Preservation, Shelf life

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Introduction

Papaya (*Carica papaya* L.) is a juicy and tasty fruit which belongs to the family Caricaceae. Practically every part of the papaya plant is of economic value. Its uses range from nutritional to medicinal [1]. Papaya (*Carica papaya* L.) is an important fruit as it is good source of vitamins, dietary fibre and minerals and provides flavour, aroma and texture to the pleasure of eating. Fully ripened papaya fruits are usually eaten fresh as the enzymes in the fruit produce calm, soothing feelings in the stomach. Papaya is known for its fine and natural laxative virtue which aids digestion. The anti-inflammatory properties and high antioxidant content of papaya is known to prevent cholesterol oxidation and can be used in preventative treatments against strokes, heart attacks, diabetic, heart disease and blood pressure [2]. In India, papaya occupies an area of 3.25 million hectares with an annual production of 276 million tones. Its average production (about 85 tones) per hectare is one of the highest and its income is next to Banana. It is mainly concentrated in the states of Uttar Pradesh, West Bengal, Assam, Gujarat, Bihar, Maharashtra and Madhya Pradesh. Papaya is known for its excellent flavor, delicious taste and healthful values. It contains high quantities of vitamin A, fair quantities of vitamin C, some riboflavin and niacin. It is a good source of fiber, calcium, phosphorous and iron. All the nutrient content of papaya completely improves cardiovascular system, protects from heart diseases, strokes, heart attacks and also prevents colon cancer. The fruit also contains beta carotene which helps to prevents damage caused by free radicals which may cause some forms of cancer. It is also reported that it helps to prevent the diabetic heart disease [3]. Papaya is primarily used as a table fruit and to a limited extent for extraction of papain and pectin. The post harvest shelf life of ripe papaya is very short and it exhibits many difficulties in bulk handling and transport. It is perishable fruit and when cut it has very short shelf life. The minimal processing operations or mild technology necessary to produce fresh-cut foods, such as peeling, cutting, washing, treatments with sanitizing agents, drying, alter the physical integrity of these products, making them more perishable than the original raw materials. This is due to respiration, transpiration, enzymatic activity of the living tissue after harvest and processing and, at the same time, to proliferation of spoilage and pathogenic microorganisms [4]. Edible films and coatings of fruits and vegetables are considered as a new preservation approach for fruits and vegetables. There are wide ranges of materials which are used to supply edible films and coatings such as lipids, polysaccharides, carbohydrates, proteins, and *etc.* each having many constituents. On top of that, each material includes different characteristics which cause unlike effects on food features [5]. Edible films and coatings is mostly considered as modified atmosphere which regulate O_2 and CO_2 transmission from coated fruits to environment and vice-versa. This in turn prevents or delays the ripening process which leads to senescence and decay of fruits and vegetables [6]. The polysaccharides as coating materials for fruits have been applied extensively in the past few years. They have benefits of availability, low cost, and biodegradability [7]. Several cellulose derivatives such as methyl cellulose (MC), carboxymethyl cellulose (CMC), and hydroxylpropylmethyl cellulose (HPMC) are widely produced commercially [5]. The coatings and films based on these cellulose ethers are commonly transparent, flexible, odorless, tasteless, water-soluble, and resistant to O_2 and CO_2 [8]. Edible coatings based on cellulose derivatives have also been used to delay ripening in some climacteric fruits like mango, papaya and avocado [9,10]. Effect of edible coating on the quality of fruit and vegetables was studied by many investigators, pineapple [11], mango [12], papaya [13, 14] and avocado [15]. The present study addresses shelf life extension of fresh cut papaya and investigates the effect of application of carboxymethyl cellulose and honey coating on fresh cut papaya.

Materials and Methods

Materials: Papaya fruits were procured from local market in Dehradun, Uttarakhand. Care should be taken to procure papaya fruit without any defect on visual inspection, homogenous size, physiological maturity and intense yellow colour. Selected fruits were cleaned and washed by removing damaged fruits.

Coating Formulation and Application

The CMC (3%) was mixed in distilled water for 30 min by stirring at 60°C. Glycerol 2% w/v was added as plasticizer and the solutions were again mixed for 20 min by stirring at the same temperature. Then they were stored at room temperature to get cold. The honey was also mixed with glycerol 2% w/v and stirred for proper mixing. The fresh equal size cut fruits were dipped in prepared formulation for 60 sec. All fruits were then air dried for approximately 60 sec and stored at 4°C and tested for quality with three replications for each treatment [16].

Qualitative Attributes Evaluation

Quality attribute of control, CMC and honey coated samples were monitored on every alternate day on the basis of weight loss, pH, size variation, TSS, titrable acidity, ash content, ascorbic acid and microbial count. The weight loss was checked by using analytical balance. Water loss was calculated in terms by following equation: (A-B)/A × 100, where A is initial weight of fruits and B is fruit weight after storage. The size reduction was measured by using Vernier caliper. TSS was measured by using hand refractometer of both coated and uncoated fruits. pH was measured using pH meter. Titrable acidity was measured by titration method [16]. Total ash content was determined by AOAC, 1984 method [17]. Microbial count is done with the help of serial dilution method [16].

Results and Discussion

The variation of weight loss during storage of time can be seen in [Fig-1]. The weight of sample was significantly decreased with increase in storage time and the decrease in weight was maximum in case of control sample than honey and CMC coated samples. Least weight reduction was seen in case of honey coated sample. During first three days of storage weight loss reaches to 40% in case of control sample and it remain slightly above 40% till nine days of storage. In case of CMC coated sample during first three days of storage weight loss was recorded 25% and it reaches to more than 40% after 11 days of storage. Maximum weight loss in case of honey coated samples were recorded 33% after 11 days of storage. However, weight loss remains 30 % during 5 to 9 days of storage period. Honey shown best result due to decrease in O_2 transpiration rate in papaya also Honey has more consistency as compared to CMC due to which it was more impermeable to external environment. Honey also showed good results as compared to controlled sample because of its antibacterial nature and thick consistency. The variation of size loss can be seen in [Fig-2].

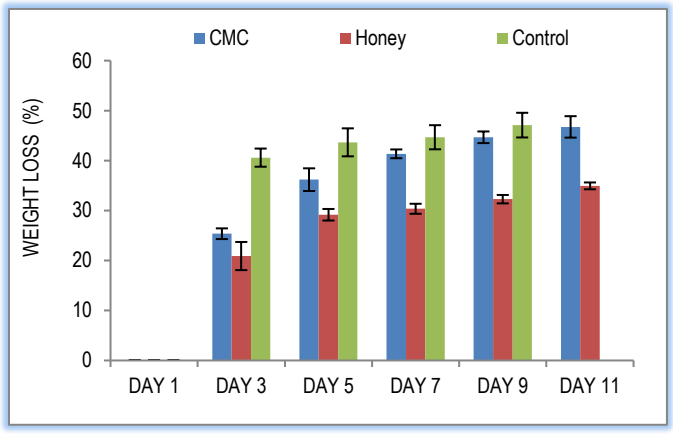

Fig-1 Variation of weight loss during storage time

The size of the sample decreases with increase in storage time. The change in size of sample had shown significant reduction in controlled sample as compared to honey coated sample while it is observed to be least in CMC coated sample with the duration of time. In CMC coated sample there is minimum loss of moisture, hence moisture is retained which is responsible for reducing the reduction of size of the samples. Honey show less reduction in size as compare to control sample because of its high anti-microbial activity and consistency which creates barrier for environment to transfer moisture. Change in TSS during storage of coated papaya is shown in [Fig-3]. The change in TSS increases with increase in TSS of the sample. There is least change in TSS of honey.

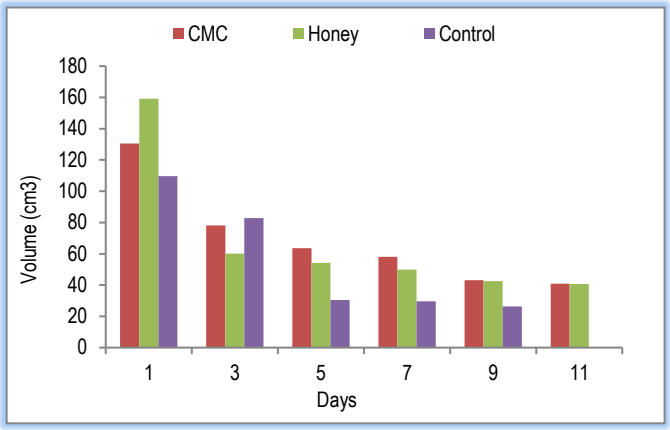

Fig-2 Variation of size loss during storage time

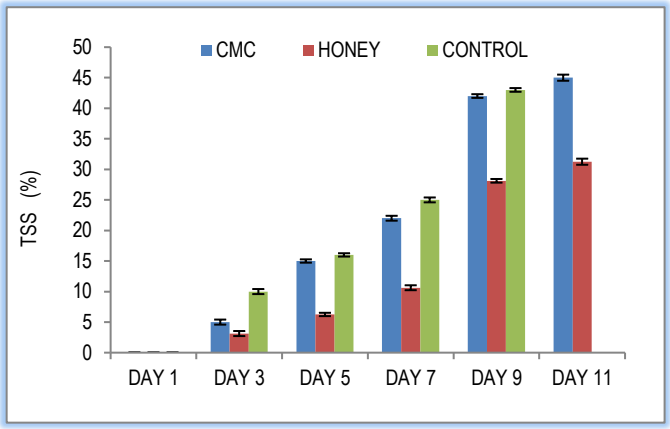

Fig-3 Change of TSS during storage time

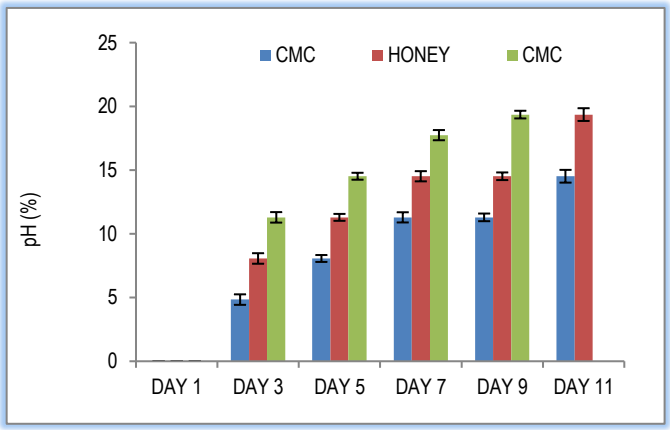

Fig-4 Change of pH during storage time

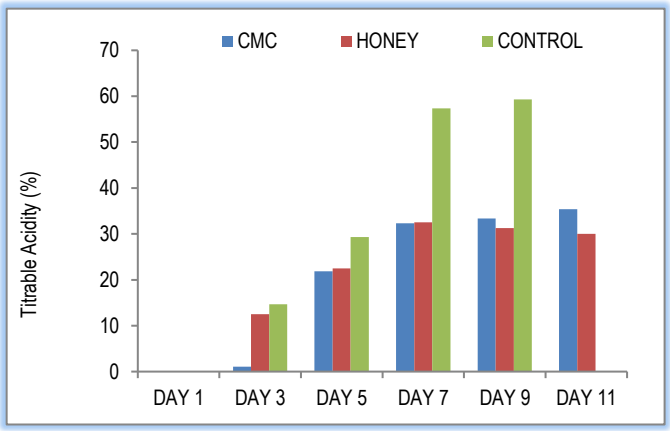

Fig-5 Change of Titrable acidity during storage time

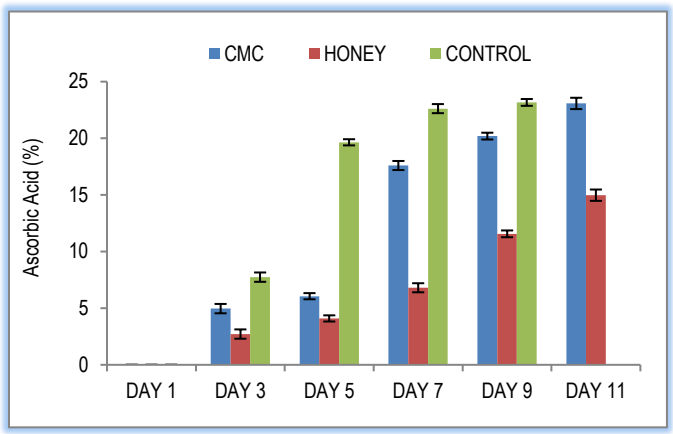

Fig-6 Variation of AAC during storage time.

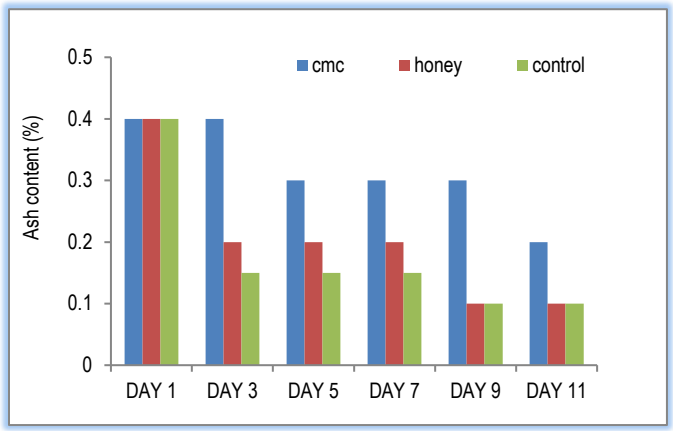

Fig-7 Variation of ash content during storage time

The maximum change in TSS was obtained in case of controlled samples with increase in storage time. After seven days of storage change in TSS were merely increased up to 10% and it increases to 30% after 11 days of storage. In case of CMC coated and uncoated sample there were comparatively sharp increase in change in TSS. The change in pH during storage of time can be seen in [Fig-4]. There is decrease in pH of the stored samples and increase in acidity of the samples. The minimum change in pH was observed for the CMC coated samples and maximum was in case of control sample. The change in titrable acidity during storage of time is shown in [Fig-5]. The titrable acidity was minimum changed in case of CMC coated samples. The change in ascorbic acid during storage of time is shown in [Fig-6]. The minimum change in ascorbic acid was observed in honey coated samples which may be due to antimicrobial property of honey. The maximum loss in ascorbic acid was shown in uncoated samples. The variation of ash content during storage time is in [Fig-7]. The maximum reduction in ash content was observed in uncoated samples. CMC coated samples shows minimum reduction in ash content of the stored samples. The microbial count result shows that CMC coated samples highest life.

Conclusion

The results of the current investigation indicate that papaya coated with CMC (CarboxyMethyl Cellulose) and honey showed a significant delay in the change of weight loss, pH change, TSS change, titrable acidity change and microbial decay during storage compared to uncoated ones. CMC shows best results as it reduces the transpiration rate and enzymatic activity of the fruits. However, honey also acted as a good barrier for moisture loss and transpiration because of its thick consistency, and due to its antibacterial nature, it also helped in avoiding the microbial spoilage for a long period of time as compared to CMC, due to which the transpiration rate is higher as compared to CMC. It can be concluded that the CMC along with edible glycerol showed the best edible coating material for enhancement of shelf life of cut fruit.

Application of research: This result of the research can be used for extension of shelf life of the fresh cut fruits.
Research Category: Preservation, Shelf Life

Abbreviations: CMC: Carboxymethyl Cellulose, TSS: Total Soluble Solids
MC: Methyl Cellulose, CMC: Carboxymethyl Cellulose
HPMC: Hydroxylpropylmethyl Cellulose

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***Principle Investigator: Er. Deepika Kohli**
University: Uttaranchal University, Dehradun, 248007, Uttarakhand
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Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

References

[1] Onibon V. O., Abulade F. O. & Lawal L. O. (2007) *J. Food Tech*, 5, 120-122.
[2] Eno A. E., Owo O. I., Itam E. H. & Konya R. S. (2000) *Phytother. Res.*, 14, 235-239.
[3] Aravind G., Bhowmik D., Duraivel S. & Harish G. (2013) *Journal of Medicinal plant studies*, 1(1), 7-15.
[4] Corbo M.R., Del Nobile M.A. and Sinigaglia M. (2006) *Int. J. Food Microbiol.*, 106, 69.
[5] Bourtoom T. (2008) *Int. Food Res J.*, 15(3), 237-248.
[6] Bal E. (2013) *J. Agri. Sci. Tech.*, 15, 1219-1230.
[7] Zhou R., Mo Y., Li Y., Zhao Y., Zhang G. & Hu Y. (2008) *Postharvest Biology and Technology*, 49, 171-179.
[8] Nisperos-Carriedo M. O., Baldwin E.A. & Shaw P. E. (1992) *Proceedings at the annual meeting of Florida State Horticultural Society*, 104, 122- 125.
[9] Baldwin E.A., Burns J.K., Kazokas W., Hagenmaier R.D., Bender R.J. & Pesis E. (1999) *Postharvest Biology and Technology*, 17, 215–226.
[10] Maftoonazad N. & Ramaswamy H.S. (2005) *LWT- Food Science and Technology*, 37, 617-624.
[11] Nimitkeatkai H., Srilaong V. & Kanlavanarat S. (2006) *ISHS ActaHorticulturae*, 712, 643-648.
[12] Carrillo-Lopez A., Ramirez-Bustamante F., Valdez-Torrez J.B., Rojas-Villegaz R. & Yahia E.M. (2000) *J. of Food Quality*, 23(5), 479-486.
[13] Gonzales-Aguilar G. A., Monroy-Garcinia I. N., GoycooleaValencia F., Diaz-Cinco M. E. & Ayala-Zavala J. F. (2005) *Symposium on "New Technologies for Preservation and Packaging of Fruits and Vegetables Fresh Cut Vegetables"*, 121– 133.
[14] Kohli D., Srivastava A., Kumar S., Upadhyay S. and Kaur G. (2018) *International Journal of Food Science and Nutrition*, 3(2), 64-66.
[15] Maftoonazad N., Ramaswamy H.S., Moalemiyan M. & Kushalappa A.C. (2007) *Carbohydrate Polymers*, 68, 341–349.
[16] Asghar A., Alamzeb, Farooq, Qazi I.M., Ahmad S., Sohail M., Islam M.S., Shinwari A.S. (2014) *Food Science and Quality Management*, 30, 40-47.
[17] AOAC. (1984) *Official methods of analysis. 14th Association of Official Analytical Chemists, Washington, V.A.*