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Influence of organic manures and fruit coatings on biochemical parameters of papaya cv. Arka Prabhat

Rekha Eda

Post Harvest Technology Research Station College of Horticulture, Venkatarammanagudem, Dr. Y.S.R.Horticultural University, Andhra Pradesh, 534101, India.

*Email: rekhapht@gmail.com

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ABSTRACT

A study was done to determine how long papaya could be stored by using recommended dose of nitrogen supplied with the organic manures viz., FYM, Vermicompost, Neem cake and sheep manure alone and in combinations and the harvested fruits are coated with aloe gel and bee wax. Among the treatment combinations, ascorbic acid content was observed highest in plants treated with 100% recommended dose of nitrogen (RDN) with sheep manure 63.37 mg $100g^{-1}$and coated with aloe gel 53.18 mg $100g^{-1}$ whereas minimum 37.82 mg $100g^{-1}$ in fruits of plants applied with 100% recommended dose of fertilizers(RDF) and in uncoated fruits 48.49 mg $100g^{-1}$ on 12^{th} day of storage. The highest total soluble solids of 12.77^{o}Brix recorded in fruits plants which were treated by RDN 100% sheep manure and in gel coated fruits with 12.46 ^{o}Brix whereas minimum of 10.84^{o}Brix in fruits of plants applied with 100% recommended dose of fertilizers(RDF) and in uncoated fruits (11.75^{o}Brix) on 12^{th} day of storage. The fruits of plants treated with vermicompost had the greatest titrable acidity 0.115%. and in fruits coated with aloe (0.097 %) and the lowest was noticed in fruits of plants supplied with complete dose of recommended inorganic fertilizersof 0.077% and in uncoated fruits 0.087% on 12^{th} day of storage. The total sugars of 9.03% was noticed highest in fruit plants treated by neem cake RDN100% and in gel coated fruits(8.34%) and lowest in fruits applied with 50% RDN FYM + Neem cake 50% RDN (7.72%) and in uncoated fruits7.93% on 12^{th} day of storage respectively.

***Keywords*:** Chemical composition, bio-coating, organic manures, papaya, storage

INTRODUCTION

Papaya is one of the important fruit crops of tropical and subtropical regions of the world. It is one of the few fruit crops that flowers and fruits throughout the year giving early (9-10 months after planting) and high yields of about 100 tones per hectare. Papaya is rich in minerals like potassium followed by sodium, phosphorous, zinc, calcium, iron and vitamins *viz*., vitamin A, C, B1 and B2, niacin and in fiber content. It has digestive enzyme papain which aids in digestion and cures many digestive related problems. It is rich in antioxidants, antimicrobial, ant carminative, and immunological properties (Farhan *et al.*,2014). However, the ripe fruits are highly perishable and cannot be stored for a longer duration. The perishability of papaya fruit was caused due to weight loss, moisture loss, softening of the flesh and prone to microbes. Since ancient times, an edible coat is used to prevent perishability of produce from deterioration by delaying dehydration, reduce the respiration, improve the texture quality and reduces microbial growth. The weak cell wall integrity of papaya directly contributes to their lower shelf life when compared to other tropical fruits. Some edible coatings, packing materials, and value addition can extend the shelf life of papaya. Despite a good papaya production in India, there is no primary processing units at the farm or wholesale/retailer levels. These are sold without proper packaging right away after harvesting. There is a lot of demand for the processed products and these can be stored for longer time than the whole fruit as a benefit to escape from perishability nature of papaya.

Due to the poor shelf life and inadequate postharvest processing, a considerable amount of papaya fruit will lose before reaching the market in underdeveloped nations. (Emana and Gebremedhin, 2007). According to estimates, papaya post-harvest losses totaled 25.49%, with 1.66% of those losses occurring in the field, 4.12%

in transit, 8.22% in the market, and 11.49% in retail (Gajanana *et al*., 2010). So the temperature and relative humidity must be controlled during storage which is chief cause of fruit and deterioration during storage. Aloe gel is safe and environmentally friendly substitute for synthetic preservatives like sulphur dioxide. It forms a protective coat against oxygen and moisture in the air, inhibits the activity in case of microorganisms which leads to food-borne diseases by its varied antibacterial and antifungal commixture, and is tasteless, colourless, and odourless (Aney *et al.,* 2020). Considering beneficial effect of manures and fertilizers and poor shelf life of mature papaya fruits, a study was conducted with an objective to know the effect of integrated nutrient management and bio-coating on change in fruit quality during storage of papaya.

MATERIALS AND METHODS

The current study was done in the year 2015–16 at the campus field of the College of Horticulture in Venkataramannagudem, Andhra Pradesh. The field trial used a Randomised Block Design (RBD) with three replications of each of the eight treatments. Each replication's allocation of treatments was random. The Indian Institute of Horticultural Research in Bengaluru provided papaya seeds of cv. Arka Prabhat. The seeds were sown in 25 x 15 cm polybags that contained a mixture of FYM, sand, and red soil at the ratio of 1:1:1 and they were routinely watered. The 45-day-old, healthy, uniform, and disease-free seedlings were chosen and planted in the pits with a spacing of 2 m 2 m distance. The necessary amounts of organic manures were estimated equivalent to recommended dose of Nitrogen (150 g/plant). The organic manures used in the experiment were FYM (Nitrogen 0.5 %), vermicompost (Nitrogen 3.0 %), neem cake (Nitrogen 5.2 %), and sheep manure (Nitrogen 3.0 %). Organic manures were applied at four splits *viz.*, one at base application and the other three at intervals of 60 days. Total quantity of inorganic nitrogen fertilizer was applied in four splits; first application as a basal dose and other 3 split applications at 2 months intervals from the first split. Four separate doses of nitrogen fertilizer, one as the basal dose, were used to apply the total dose. The treatments were comprised of T_1 - FYM 100% Recommended dose of Nitrogen (RDN), T_2- Vermicompost 100% RDN, T_3 - Neem cake 100% RDN, T_4 - Sheep manure 100% RDN, T_5- FYM 50% RDN + Vermicompost 50% RDN, T_6- FYM 50% RDN + Neem cake 50% RDN, T_7- FYM 50% RDN + Sheep manure 50% RDN and T_8- 100 % Recommended dose of fertilizer (RDF).

For storage study the matured papaya fruits showing two yellow streaks were harvested from the above field treatment papaya plants applied with different organic manures separately. The harvested fruits were washed in running tap water thoroughly and air dried at room temperature. After drying for about 6 hours**,** the fruits were coated with commercially available aloe gel and bee wax. There was three coating treatments viz., aloe get at 2% (C1), bee wax at 2% (C2) and uncoated (C3). The fruits were dipped in respective coating solutions for a period of fifteen minutes and then allowed to drain and form a thin film over the fruit surface. The coated and uncoated fruits were weighed and stored in ambient conditions for different storage studies. The biochemical parameters, ascorbic acid, Total Soluble Solids, acidity and Total Sugars were analyzed at 4 days intervals and the laboratory study was employed is Factorial CRD with two number of replication and in each replication there were 20 number of fruits in each replication.

Following bio-chemical studies were taken:

i. Estimation of ascorbic acid

Ascorbic acid content (mg $100g^{-1}$) has been observed by extracting 10 grams of papaya pulp which do blend along metaphosphoric acid (3% HPO_3) and volume was compose to 100 ml with HPO_3 (3%). The total volume was shacked well and filtered by Whatman No.1 filter paper. 10 ml aliquot filtrated solution was titrated against 2,6-dichlorophenol-indophenol dye till light pink colour noticed (AOAC, 1965). The ascorbic acid content was estimated by using the following formulae and stated in milli gram per 100 gram.

$$\text{Ascorbic acid } \left(\text{mg } 100\text{g}^{-1}\right) = \frac{\text{Titre value x Dye factor x Volume made up x 100}}{\text{Volume of the sample taken x Volume of aliquot taken}}$$

ii. Estimation of TSS

The TSS was decisive by using ERMA hand refractrometer through place a drop of juice on prism of refractrometer and observes the coexistence of shadow of the sample with the reading on the scale and expressed as ^{O}Brix. Before taking the reading, the refractrometer was tested for its error with distilled water, corrected accordingly and TSS content was recorded as per the procedure of Ranganna (1986).

iii. Estimation of acidity

Ten grams of papaya pulp was extracted, grinded and transferred to flask and volume was making up to 100 ml by using distilled water. The extract was filtered by whatman No.1 filter paper. An aliquot of 10 ml was transferred to conical flask, add 2-3 drops of phenolphthalein indicator and titrate against 0.1 N NaOH until pink colour was observed, which carries on for 15 seconds and was considered as end point as per the procedure given by (Ranganna, 1986). The titrable acidity has been calculated by the below formulae and given in percentage.

$$\text{Titrable acidity } (\%) = \frac{\text{Titre value} \times \text{ Normality of NaOH } \times 0.0064 \times 100}{\text{Volume of aliquot taken } (\text{ml})}$$

iv. Estimation of total sugars

The total sugars were resolute as procedure given by Lane and Eyon method (AOAC, 1965). A 50 ml lead free filtrated extract was taken in a 100 ml volumetric flask, added 5 ml of 50% HCl to it, mixed toughly and then wait for 24 hours at room temperature. Acid has been neutralized by NaOH and use a drop of phenolphthalein indicator till pink colour persist for few seconds. The volume has been make up to 100 ml with distilled water. Total sugars are evaluated by taking solution into a burette and titrated against a mixture of standard Fehling's solution of A and B (1:1) by make use of methylene blue as indicator till the brick red colour precipitate was formed. The per cent total sugar was obtained by using the below formula:

$$\text{Totalsugars } (\%) = \frac{\text{Factor x Volume made up x 100}}{\text{Titer value x Weight of the sample}}$$

RESULTS AND DISCUSSION

Effect on ascorbic acid

The data on ascorbic acid content of papaya fruits was influenced by the applied nutrients through different organic manures and inorganic fertilizers and application of bio-coatings to fruits were presented in Figure 1. On 1st day of storage, the highest ascorbic acid of 69.65 mg 100g^{-1} has been recorded in fruit of plants supplied by sheep manure 100% RDN and lowest of 48.52 mg 100g^{-1} in fruit of plants supplied by 100% inorganic RDF.

On fourth day of storage, ascorbic acid levels ranged from a minimum of 44.37 mg 100g^{-1} in fruit of plants supplied by 100% RDF to a highest of 68.13 mg 100g^{-1} in fruit of plants supplied by 100% RDN of sheep dung. On the fourth day of storage, the ascorbic acid concentration of the fruits coated with aloe gel reached a highest of 58.07 mg 100g^{-1} and a minimum of 56.12 mg 100g^{-1} for the uncoated fruits. On the fourth day of storage, the ascorbic acid content in the interactions ranged from a minimum of 44.00 mg 100g-^{1} in fruits of plants supplied by 100% RDF without coating to a highest of 68.70 mg 100g^{-1} in fruits of plants supplied by sheep manure 100% RDN coated with gel.

The highest ascorbic acid of 66.06 mg 100g^{-1} was observed in fruits of plants supplied by sheep manure and minimum of 41.38 mg 100g^{-1} in fruits of plants supplied with 100% RDF on 8th day of storage. The fruits coated with aloe gel showed maximum ascorbic acid of 56.08 mg 100g^{-1} and minimum of 52.50 mg 100g^{-1} for uncoated fruits on 8th day of storage. Among the interactions, ascorbic acid was maximum of 67.33 mg 100g^{-1} in fruits obtained from plants supplied by sheep manure 100% RDN coated with gel and minimum of 40.25 mg 100g^{-1} in fruits of plants supplied by 100% RDF uncoated on 8th day of storage.

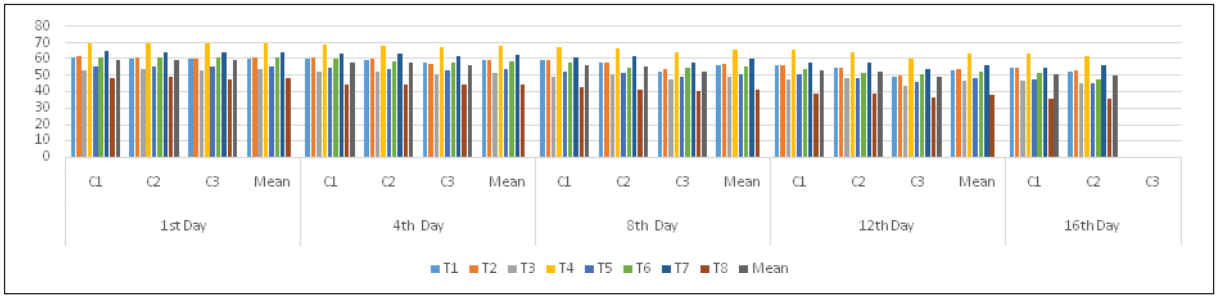

Fig. 1 : Effect of nutrient management and fruit coatings on ascorbic acid content (mg/100g) of papaya fruits at different storage dates

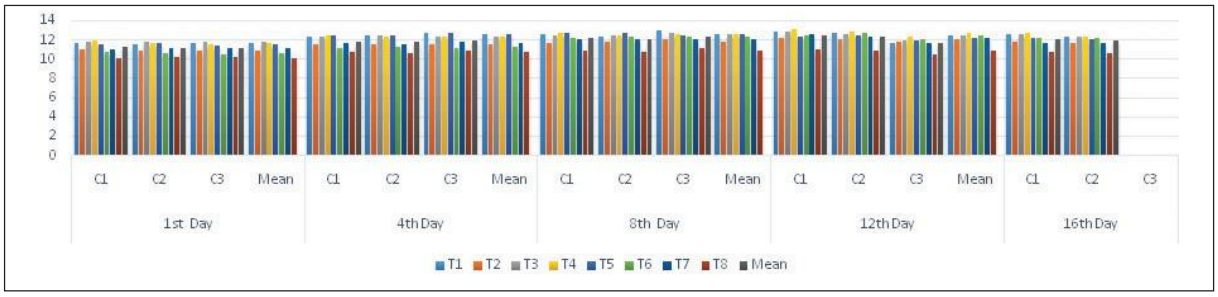

Fig. 2 : Effect of nutrient management and fruit coatings on TSS content (^{0} Brix) of papaya fruits at different storage dates

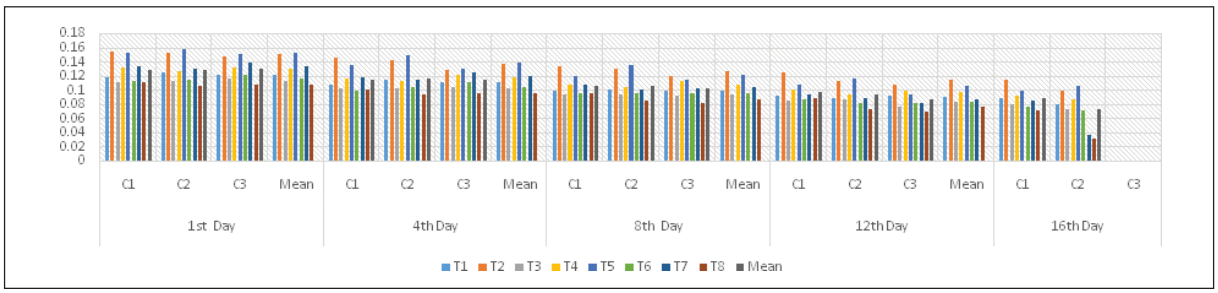

Fig. 3: Effect of nutrient management and fruit coatings on acidity content (%) of papaya fruits at different storage dates

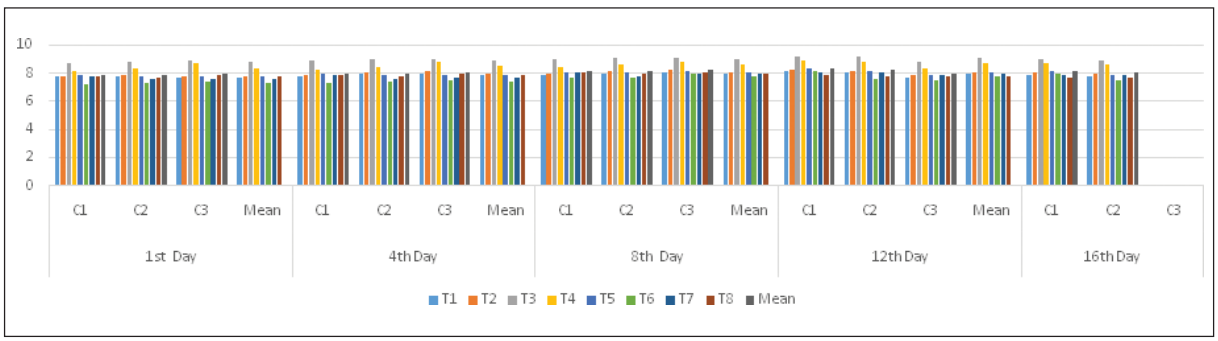

Fig. 4 : Influence of organic manures and biocoatings on total sugars (%) of papaya

On 12th day of storage, highest ascorbic acid of 63.37 mg $100g^{-1}$ has been observed in fruits of plants supplied by sheep manure 100% RDN and minimum of 37.82 mg $100g^{-1}$has been observed in fruits of plants supplied by 100% RDF. The fruits coated with aloe gel showed highest ascorbic acid of 53.18 mg $100g^{-1}$ and minimum of 48.94 mg $100g^{-1}$ for uncoated fruits on 12th day of storage. Among the interactions, ascorbic acid content was maximum of 65.42 mg $100g^{-1}$ in fruits of plants supplied by sheep manure 100% RDN coated with aloe gel and minimum of 36.41 mg $100g^{-1}$ in fruits of plants supplied by 100% RDF uncoated on 12th day of storage.

In the present research, the maximum ascorbic acid of 69.65, 68.13, 66.06 and 63.37 mg $100g^{-1}$ was recorded in fruits of plants supplied by sheep manure 100% RDN on 1st, 4th, 8th and 12th day of storage respectively. The fruits coated with aloe gel showed maximum ascorbic acid content of 44.75, 42.45 and 37.82 mg $100g^{-1}$ on 4th, 8th and 12th day of storage respectively. Ascorbic acid is a crucial indicator of the fruit's nutrient content and is very susceptible to oxidative deterioration (Veltman *et al.,* 2000) compared to other nutrients during food processing and storage. The increased metabolic processes brought about by the balanced nutrient availability contributed to the improved fruit quality using organic and inorganic manures (Singh *et al*., 2004). The higher uptake of potassium in plants supplied by sheep manure 100% RDN might resulted in higher content of ascorbic acid. Similar result of improved fruit quality with organic manures compared to RDF were given by Ravishankar *et al.* (2010) in papaya and Singh and Sharma (2006) in apple was reported.

Higher ascorbic acid levels in the Aloe gel-treated fruits than in the control fruit could be attributed to decreased cytochrome oxidase, ascorbic acid oxidase, and peroxidase activity during respiration. Aloe vera gel coating's reduced oxygen permeability, which decreased the activity of degrading enzymes and prevented ascorbic acid oxidation, the loss of ascorbic acid content in coated orange fruits was smaller. as reported by Adetunji *et al.*(2012).

Effect on TSS

The data concern to TSS of papaya fruits has been influenced by organic manures and biocoatings was given in Figure 2. The significant differences were observed with the supply of organic manures and bio-coatings at different days of storage. Interactions were found to be non-significant at 4th day, 8th day and 12th day of storage.

The lowest total soluble solids of 10.16°Brix has been observed in fruits of plants supplied by 100% RDF on 1st day of storage and the highest of 11.81°Brix were recorded in fruits of plants supplied by neem cake 100% RDN. The fruits coated with aloe gel showed highest TSS of 11.24°Brix and minimum of 11.17°Brix in uncoated fruits on 1st day of storage., the minimum of 10.09°Brix was observed in fruits of plants supplied by 100% RDN coated with aloe gel and highest total soluble solids of 11.91°Brix were recorded in fruits of plants supplied with sheep manure 100% RDN coated with gel which was on par and uncoated fruits of plants supplied by neem cake 100% RDN (11.82°Brix) and with the fruits of plants supplied by neem cake 100% RDN coated with aloe gel (11.83°Brix) among the interactions.

The maximum total soluble solids of 12.59 °Brix were recorded in fruits of plants supplied with 50% nitrogen by Farm yard manure in combination with vermicompost 50% RDN which is on par with the fruits of plants supplied by FYM 100% RDN (12.55°Brix) and lowest of 10.78°Brix in fruits of plants supplied by 100% RDF on 4th day of storage. The uncoated fruits showed maximum TSS of 11.96°Brix and fruits coated with bee wax had minimum of 11.85°Brix on 4th day of storage.

On 8th day of storage, maximum total soluble solids of 12.64°Brix were recorded fruits of plants supplied with 50% nitrogen by Farm yard manure in combination with vermicompost 50% RDN which was on par with the fruits of plants applied with FYM 100% RDN (12.62°Brix) and neem cake 100% RDN (12.56°Brix) and minimum of 10.78°Brix was recorded in fruits of plants applied with 100% RDF. The uncoated fruits showed maximum TSS of 12.31°Brix and fruits coated with bee wax had minimum of 12.14°Brix on 8th day of storage.

The maximum total soluble solids of 12.77°Brixwas observed fruits of plants applied with 100% recommended dose of nitrogen with sheep manure and minimum of 10.84°Brix in fruits of 100% inorganic fertilizers as per

recommendation on 12th day of storage. The fruits coated with aloe gel showed maximum total soluble solids of 12.46°Brix and minimum of 11.75°Brix for uncoated fruits on 12th day of storage.

Present study, it was recorded that fruits obtained from organic manure treated plants particularly with sheep manure 100% RDN recorded higher total soluble solids in the fruit, may be due to release of plant hormones and easy nutrient uptake. The peak in TSS initially may be due to increase of transpiration from fruit surface and decrease at later stage is due to rapid utilization of soluble solids during respiration. These results were in consistent with findings of Babu Ratan (2006). The increased fruit quality is due to increased nutrient availability and better uptake of nutrient from the soil. These results were in conformity with the findings of Singh and Sharma (2006) and Aditi *et al*. (2020).

Further, the increase in TSS of coated fruits may be due to less transpiration and by creation of modified atmosphere. This might have led to slow down in the carbohydrate metabolism and delayed starch hydrolysis. The present findings infers that the coated fruits had delayed increase in TSS compared to quick increase in uncoated fruits which were similar with findings of Adetunji *et al*. (2014) in cucumber, Kumar and Bhatnagar (2014) and Ochiki Sophia *et al*. (2015) in mango.

Effect on acidity

The titrable acidity of papaya fruits as persuaded by application of different organic manures and inorganic fertilizers and bio-coatings to fruits (Figure 3) indicated significant differences in nutrient management, bio-coatings and their interactions on 4th day, 8th day and 12th day of storage respectively.

On 1st day of storage, the highest titrable acidity content of 0.153% was recorded in fruits of plants supplied with 50% nitrogen by Farm yard manure in combination with vermicompost 50% RDN which is equipollent with vermicompost 100% RDN (0.151%) and lowest of 0.108% in fruits of 100% RDF. Among the interactions, the maximum titrable acidity of 0.158% was recorded in the fruits of plants supplied by 50% nitrogen by Farm yard manure in combination with vermicompost 50% RDN coated with bee wax which is equipollent with the vermicompost 100% RDN fruits coated with aloe gel (0.154%) and minimum of 0.105% in fruits of plants supplied by 100% RDF coated with bee wax on 1st day of storage.

On 4th day of storage, the highest titrable acidity of 0.139% is observed in fruits of plants supplied by 50% nitrogen by Farm yard manure in combination with vermicompost 50% RDN which is equipollent with vermicompost 100% RDN (0.137%) and least 0.096% in fruits of plants applied with 100% RDF. Among the interactions, the highest titrable acidity content of 0.148% was recorded in the fruits of plants supplied by 50% nitrogen by Farm yard manure in combination with vermicompost 50% RDN coated with bee wax and minimum of 0.094% in fruits of plants supplied by 100% RDF coated with bee wax on 4th day of storage.

On 8th day of storage, the highest titrable acidity content of 0.127% was observed in fruits of plants supplied by vermicompost 100% RDN which was on par with fruits of plants supplied by50% nitrogen by Farm yard manure in combination with vermicompost 50% RDN(0.122%) and minimum (0.087%) in fruits of plants supplied by 100% RDF. The fruits coated with aloe gel showed maximum titrable acidity of 0.106% which was on par with fruits coated with bee wax (0.105%) and minimum of 0.102% in uncoated fruits on 8th day of storage. Among the interactions, the highest titrable acidity content of 0.135% was observed in fruits of plants supplied with 50% nitrogen by Farm yard manure in combination with vermicompost 50% RDN coated with bee wax which is equipollent with the vermicompost 100% RDN fruits coated with aloe gel (0.133%) and vermicompost 100% RDN fruits coated with bee wax (0.129%) and lowest 0.082% in fruits of plants supplied by 100% RDF uncoated fruits 8th day of storage.

On 12th day of storage, the highest titrable acidity content of 0.115% was recorded in fruits of plants supplied by nitrogen in the form of vermicompost 100 per cent and minimum of 0.077% in fruits of applied with 100% RDF. The fruits coated with aloe gel showed maximum titrable acidity content of 0.097% and minimum of 0.087% in uncoated fruits on 12th day of storage. Among the interactions, the highest titrable acidity content of 0.125% was recorded in the fruits of

plants supplied by vermicompost 100% RDN coated with aloe gel and lowest of 0.070% in fruits of plants supplied by 100% RDF uncoated fruits.

In the present investigation, the highest titrable acidity content (0.151, 0.137, 0.127 and 0.115%) was recorded in fruits of plants supplied by vermicompost 100% RDN on 1st day, 4th day, 8th day and 12th day of storage respectively. The fruits coated with aloe gel showed maximum titrable acidity content (0.106% and 0.097%) on 8th day and 12th day of storage. The titrable acidity content of fruits was decreased significantly from 1stday to 12th day of storage in all the treatments. The acidity in fruits is an important factor in determining maturity. Titrable acidity gives the total or potential acidity, rather than indicating the number of free protons in any particular sample. It is a measure of all aggregate acids and sum of all volatile and fixed acids. In the present study, the titrable acidity of the papaya fruits was declined significantly over the storage period. There was a gradual decline in the titrable acidity content of fruits with the storage period. This might be due to the conversion of organic acids into simple sugars and their utilization during respiration.

The decrease in acidity in uncoated fruits is high when compared to coated fruits may be due to higher rate of respiration and greater reduction in acidity in uncoated fruits compared to coated fruits with aloe gel. The lesses rate of respiration in coated fruits may be due to due to lesser use of organic acids. These findings were also in conformity with the work carried out by Vahdat *et al*. (2010) in strawberry, Arowora *et al.* (2013) in oranges and Jawadul *et al*. (2014) in their review report of alovera gel coatings.

Effect on total sugars

The data on total sugars of papaya fruits as effected by the nutrient management and fruit coatings were given in Figure 4 and revealed significant differences in nutrient management and bio-coatings and interactions.

The highest total sugars of 8.78% was observed in nitrogen supplied plants with neem cake alone and lowest of 7.26% fruits of plants supplied with 50% nitrogen by Farm yard manure in combination with neem cake 50% RDN. The uncoated fruits recorded maximum total sugars of 7.93% and minimum of 7.85% in fruits coated with aloe gel on 1st day of storage. Among the interactions, highest sugars (8.87%) was recorded in the in nitrogen supplied plants with neem cake alone and without coationg which was on par with nitrogen supplied plants with neem cake alone coated with bee wax (8.82%) and lowest of 7.20% in plants treated with nitrogen half dose with FYM and half through neem cake coated with aloe gel on 1st day of storage.

On 4th day of storage, the highest total sugars of 8.92% was observed in nitrogen supplied plants with neem cake alone and lowest of 7.38 % fruits of plants supplied with 50% nitrogen by Farm yard manure in combination with neem cake 50% RDN. The uncoated fruits recorded highest total sugars of 8.08% and lowest of 7.96% in fruits coated with aloe gel on 4th day of storage. Among the interactions, highest total sugars of 8.97% was observed in the fruits of plants supplied with nitrogen in the form of neem cake alone and uncoated and lowest of 7.31% in fruits of plants supplied with 50% nitrogen by Farm yard manure in combination with vermicompost 50% RDNRDN coated with aloe gel on 4th day of storage.

On 8th day of storage, the highest total sugars of 9.00was observed in nitrogen supplied plants with neem cake alone and lowest of 7.77 % fruits of plants supplied with 50% nitrogen by Farm yard manure in combination with neem cake 50% RDN. The uncoated fruits recorded highest total sugars of 8.25% and minimum of 8.11% in fruits coated with aloe gel on 8th day of storage.

The highest total sugars of 9.03% was observed in of plants treated with nitrogen in the form of neem cake alone and lowest (7.72%) in fruits of plants supplied with 50% nitrogen by Farm yard manure in combination with neem cake 50%.The highest total sugar of 8.34% was recorded in fruits coated with aloe gel and lowest of 7.93 in fruits without coating on 12th day of storage. The highest total sugars (9.16%) was recorded in fruits coated with aloe gel from the plants where nitrogen is supplied in the form of neem cake alone and minimum (7.46%) was observed in fruits of plants applied with nitrogen half dose with FYM and other half with sheep manure on 12th day of storage.

In the present study, the highest total sugars of 8.78, 8.92, 9.00 and 9.03% were recorded in fruits

of plants where nitrogen is supplied through neem cake on all days of storage. The conversion of cell wall material by hydrolysis of polysaccharides takes place initially and hence initially there will be increase in total sugars and due to respiration decreases at later period of storage. Dutta Ray *et al.* (2014) also reported that plants applied with neem cake had higher total sugars.

In the present investigation, the coated fruits had significantly more sugars content than without coating may be due to less exchange of gases from the fruit surface into the atmosphere during storage of fruits. The higher total sugars with aloe gel coatings might be due to decrease in rate of respiration and eventually catabolism of solids including sugars and organic acids. Aloe gel coated fruits reported highest total sugars content in strawberry (Vahdat *et al*., 2010) and waxing in pineapple (Huigang *et al.,* 2011) and Dikki *et al.* (2010) in papaya.

CONCLUSION

The highest biochemical compounds were observed during storage in the plants in which nitrogen is supplied through organic sheep manure, vermicompost and neem cake and fruits coated with aloe gel and bee wax when compared to plants grown with inorganic fertilizers alone and uncoated fruits. The shelf can be easily increased by the application of organic manures in the field and by using edible fruit coatings after harvest in papaya cv. Arka Prabhat.

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