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Influence of packing material and storage conditions on quality and sensory attributes of Palmyrah (Borassus flabellifer L.) tender fruit endosperm

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Abstract— The study was focused to determine the effect of packing material and storage conditions on the physio-chemical changes that occurs during the storage life of the palmyrah tender fruit endosperm (nungu). The experiment was conducted in completely randomized factorial design with two factors at unequal levels and replicated thrice. LDPE 50 micron pouch, HDPE 50 micron pouch and aluminium foil pouch were the packing material and ice box, cold storage at 2°C, cold storage at 4°C and refrigerated storage were the storage conditions used during the period of investigation. During the storage the physico-chemical properties like total soluble solids, pH and reducing sugars followed an increasing trend upto 6th day. Whereas, this highest browning and titrable acidity content were recorded upto 8th day of storage. Significant difference for physico-chemical properties viz., maximum total soluble solids (7.16°Brix), reducing sugars (5.41%), minimum titrable acidity (0.418%) and browning (0.026%) were recorded when palmyrah tender fruit endosperm was packed in LDPE 50 micron pouch. Similarly, the maximum total soluble solids (8.94°Brix), reducing sugars (5.39%), minimum titrable acidity (0.429%) and browning (0.028%) were recorded when palmyrah tender fruit endosperm was stored in cold storage at 2°C. Superiority for sensory evaluation was reported for nungu packed in LDPE 50 micron and stored in cold storage at 2°C upto the end of the shelf life i.e., 8th day.

Keywords: palmyrah tender fruit endosperm, nungu, browning, shelf life

INTRODUCTION

In India, palmyrah (*Borassus flabellifer* L.) adorns the dry landscape of the semi arid regions of Tamil Nadu, Andhra Pradesh, Gujarat, Odisha, West Bengal, Bihar, Karnataka and Maharashtra. Current palmyrah palm wealth of India is estimated as 102 million palms and half of them are in Tamil Nadu. Out of 51.90 million palms in Tamil Nadu, more than 50% of palms are concentrated in the Southern district of Thoothukudi (Anonymous, 2015).

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Palmyrah is referred as tree of life with nearly 800 uses including food, beverage, fiber, fodder, medicinal and timber. Among the various edible uses of the palm, the tender fruit endosperm is very young, the kernel is hollow, soft as jelly and translucent like ice and is accompanied by a watery liquid, sweetish and potable. The jelly part of the fruit is covered with a thin, yellowish-brown skin. These are known to contain watery fluid inside the fleshy white body. Palmyrah tender fruit endosperm contains 43 kcal of energy, 87.6 g of water, 0.8 g of protein, 0.1 g of fat, 10.9 g of carbohydrates, vitamin B and minerals per 100 g fresh weight of palmyrah tender fruit endosperm (Piyush, 2016).

The outer skin of palmyrah tender fruit endosperm starts browning and looses appearance and will be fermented after removing from husk which cause sour odour. It is main factor for consumer to judge its freshness. In normal conditions, nungu will have very short shelf life of 2-3 days. Selecting technological processes to preserve the natural wholesome properties of palmyrah tender fruit endosperm still remains a challenge. Under these circumstances, the post-harvest management of tender fruit endosperm with sufficient shelf life is most important. In this context, development of post harvest treatments like, packing material and storage conditions significantly increase shelf life, reduce post-harvest losses and maintain nutritional quality of palmyrah tender fruit endosperm (*nungu*).

Material and methods

Palmyrah fruits with uniform size were procured from nearby palmyrah palms of local farmers. The endosperm (35-45 mm diameter) with white outer skin was separated from freshly harvested palmyrah fruits in the early morning and transferred to cold storage unit, Postharvest Technology Research Station, Dr. Y.S.R Horticultural University, Venkataramannagudem and kept at low temperature to minimize the change in colour.

Freshly harvested palmyrah palm tender fruit endosperm (*nungu*) with uniform size and full outer skin were used for study. Fresh nungus were filled in three different packing material *viz.,* LDPE 50 micron pouch (P_1), HDPE 50 micron pouch (P_2) and aluminium foil pouches (P_3). Filled packs were stored at different storage conditions *viz*., ice box (Thermocol box filled with ice) (S_1), cold storage at 2°C (S_2), cold storage at 4°C (S_3), refrigerated storage (8-10°C) (S_4) and ambient conditions (S_5).

However, nungu stored under ambient conditions was spoiled in all the packing materials within 14 hours and analysis could not be carried out. Hence, the samples were discarded on 1st day of storage and further no physico chemical parameters were analyzed.

Estimation of physico-chemical parameters of palmyrah tender fruit endosperm Total Solubule Solids (TSS) were determined with the help of digital refractometer by placing a drop of sample in the form of juice at room

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temperature. Reducing sugars and total sugars were determined by the method suggested by (Lane and Eyon, 1965). The method described by (Ranganna, 2010) was adopted for the determination of titrable acidity. The pH of the sample was tested by taking direct reading on pH meter model HI 9321 (periodically calibrated with buffer solution of pH 4.0 and 7.0) according to (AOAC, 1992). Non enzymatic browning was estimated as per the method given by (Ranganna, 2010).

Titrable acidity (%) =

$$\frac{\text{Titre value x Normality ofalkali x Total volume made up x Equivalent weight of citric acid}}{\text{Aliquot taken for estimation x weight of sample x 1000}} \text{ X 100}$$

Sensory parameters

The effect of packing material and storage conditions on taste, flavour and overall acceptability of palmyrah endosperm was evaluated by a panel consisted of ten panelists and points were given as per 9 point hedonic scale procedure, as described by (Amerine et al., 1965). The panelists free from any addict related to taste bud damage like wine, tobacco *etc* were selected for evalution. Higher scoring was treated as more acceptable from the taste point of view.

Statistical analysis

The data obtained were analyzed statistically by following standard methods developed by (Panse and Sukhatme, 1985) for factorial with Complete Randomized Design (CRD). Statistical significance was tested, using 'F' value at 5 per cent level of significance. Critical difference at 5 per cent level was worked out for the effects which were found significant.

Results and discussion

Quality parameters of Palmyrah tender fruit endosperm

Palmyrah tender fruit endosperm packed in different packing material stored under different storage conditions were analysed for quality and sensory parameters at two days interval and are presented in table 1 and 2.

Physico-chemical characters of palmyrah tender fruit endosperm

Total soluble solids (^{o}Brix)

The initial value for TSS of *nungu* was found as 8.50^{o}Brix. It was evident from the data that, the TSS of *nungu* increased during storage period upto sixth day and TSS values ranged from 8.61 to 9.01^{o}Brix. Among the packing material, maximum TSS content *i.e.,* 8.86 to 8.94^{o}Brix was recorded from 2nd to 6th day of storage respectively when *nungu* packed in LDPE 50 micron pouch (P_1). The minimum TSS content *i.e.,* 8.68 to 8.78^{o}Brix was recorded from 2nd to 6th day of storage respectively when *nungu* packed in aluminium foil pouches (P_3).

Maximum TSS *i.e.,* 8.89 to 8.92^{o}Brix was recorded from 2nd to 6th day of storage respectively when *nungu* stored at 2^{o}C (S_2). Whereas, the minimum TSS *i.e.,* 8.68 to 8.82^{o}Brix was recorded from 2nd to 6th day of storage respectively when *nungu* stored in ice box (S_1) among storage conditions.

Potential hydrogen and titrable acidity

The initial pH value of *nungu* was recorded as 6.44. It was evident from the data that, the pH

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of *nungu* decreased during storage period upto 8th day and ranged from 6.40 to 5.90. Among packing material, the maximum pH *i.e.,* 6.32 to 6.19 was recorded from 2nd to 8th day of storage respectively when *nungu* packed in LDPE 50 micron pouch (P_1). Whereas, the minimum pH *i.e.,* 6.14 to 5.97 was recorded from 2nd to 8th day of storage respectively when *nungu* packed in aluminium foil pouches (P_3).

The maximum pH *i.e.,* 6.30 to 6.18 was recorded from 2nd to 8th day of storage respectively when *nungu* stored at 2°C (S_2). Whereas, the minimum pH *i.e.,* 6.19 to 6.05 was recorded from 2nd to 8th day of storage respectively when *nungu* stored in ice box (S_1) among storage conditions.

The initial value for titrable acidity of *nungu* was recorded as 0.060%. It was evident from the data that, the titrable acidity of *nungu* increased during storage period upto 8th day and ranged from 0.064 to 0.644%. Among packing material, the minimum titrable acidity *i.e.,* 0.145 to 0.418% was recorded from 2nd to 8th day of storage respectively when *nungu* packed in LDPE 50 micron pouch (P_1). The maximum titrable acidity *i.e.,* 0.370 to 0.595% was recorded from 2nd to 8th day of storage respectively when *nungu* packed in aluminium foil pouches (P_3).

The minimum titrable acidity *i.e.,* 0.172 to 0.429% was recorded from 2nd to 8th day of storage respectively when *nungu* stored at 2°C (S_2). The maximum titrable acidity *i.e.,* 0.322 to 0.579% was recorded from 2nd to 8th day of storage respectively when *nungu* stored in ice box (S_1) among storage conditions.

Reducing sugars (%)

The initial value for reducing sugars of *nungu* was found as 5.11%. It was evident from the data that, the reducing sugars of *nungu* increased during storage period upto 6th day and ranged from 5.15 to 5.46%. Among packing material, the maximum reducing sugars *i.e.,* 5.34 to 5.41% was recorded from 2nd to 6th day of storage respectively when *nungu* packed in LDPE 50 micron pouch (P_1). The minimum reducing sugars *i.e.,* 5.19 to 5.27% was recorded from 2nd to 6th day of storage respectively when *nungu* packed in aluminium foil pouches (P_3).

The maximum reducing sugars *i.e.,* 5.33 to 5.39% was recorded from 2nd to 6th day of storage respectively when *nungu* stored at 2°C (S_2). The minimum reducing sugars *i.e.,* 5.23 to 5.30% was recorded from 2nd to 6th day of storage respectively when *nungu* stored in ice box (S_1) among storage conditions.

Total sugars (%)

The initial value of total sugars in *nungu* was recorded as 8.83%. It was evident from the data that, the total sugars of *nungu* decreased during storage period upto 8th day and ranged from 8.78 to 8.26%. Among packing material, the maximum total sugars content *i.e.,* 8.73 to 8.59% was recorded from 2nd to 8th day of storage respectively when *nungu* packed in LDPE 50 micron pouch (P_1). The minimum total sugars content *i.e.,* 8.50 to 8.36% was

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recorded from 2nd to 8th day of storage respectively when *nungu* packed in aluminium foil pouches (P_3).

The maximum total sugars *i.e.,* 8.67 to 8.54% were recorded from 2nd to 8th day of storage respectively when *nungu* stored at 2°C (S_2). The minimum total sugar *i.e.*, 8.52 to 8.37% was recorded from 2nd to 8th day of storage respectively when *nungu* stored in ice box (S_1) among storage conditions.

Browning (%)

The initial value for browning of *nungu* was recorded as 0.010%. It was evident from the data that, the browning of *nungu* increased during storage period upto 8th day and ranged from 0.011 to 0.048%. Among the packing material, the minimum browning of *nungu i.e.,* 0.017 to 0.026% was recorded from 2nd to 8th day of storage respectively when *nungu* packed in LDPE 50 micron pouch (P_1). The maximum browning of *nungu i.e.,* 0.029 to 0.043% was recorded from 2nd to 8th day of storage when *nungu* packed in aluminium foil pouches (P_3).

The minimum browning of *nungu i.e.,* 0.018 to 0.028% was recorded from 2nd to 8th day of storage respectively when *nungu* stored at 2°C (S_2). The maximum browning *i.e.,* 0.032, 0.037 and 0.040% was recorded on 4th, 6th and 8th day of storage respectively when *nungu* stored in ice box (S_1) among storage conditions.

Sensory Parameters

The data pertaining to evaluation of sensory parameters like taste, flavour and overall acceptability upto end of storage period *i.e.,* 8th day and were presented in table 3.

Taste

The sensory score for taste of *nungu* was ranged from 9.00 to 3.80 during the storage. On 2nd, 4th, 6th and 8th day of storage, the highest scores for taste *i.e.,* 9.00, 8.00, 6.80 and 6.00 respectively were recorded for *nungu* packed in LDPE 50 micron pouch and stored at 2°C (P_1S_2).

Flavour

The sensory score for flavour of *nungu* was ranged from 8.80 to 3.80 during the storage period of eight days. On 2nd, 4th, 6th and 8th day of storage, the highest scores for flavour *i.e.,* 8.80, 7.80, 6.80 and 6.00 were recorded in LDPE 50 micron pouch and stored at 2°C (P_1S_2).

Overall acceptability

The sensory score for overall acceptability of *nungu* ranged from 8.80 to 3.00 during the storage. On 2nd, 4th, 6th and 8th day of storage, the highest scores for overall acceptability *i.e.,* 8.80, 7.00, 6.00 and 5.00 were recorded in LDPE 50 micron pouch and stored at 2°C (P_1S_2).

Discussion:

A change in TSS content is a natural phenomenon which occurs during storage and it is correlated with hydrolytic changes in polysachrides during postharvest period. The TSS content of nungu increased initially and then started to decline on 8th day of storage. The increase in TSS upto 6th day of storage and decline thereafter which can be attributed to the

fact on complete hydrolysis of polysachrides, no further increase in TSS occur and consequently a decline in TSS is predictable as they are the primary substrates for respiration (Wills *et al*., 1980). However, utilization of sugars in respiration and degradation of total soluble substance because of storage are possible reasons for the decrease in TSS after six days of storage.

Increase in TSS was observed at initial storage period when *nungu* packed in LDPE 50 micron pouch (P_1) and then at later stage it was declined on 8th day of storage. It might be due to more permeability of LDPE and gas exchange reduces the respiration rate and degradation. Minimum TSS was found in *nungu* packed in aluminum pouches (P_3), it might be due to the lower permeability and gas exchange of the packaging materials which increase the respiration rate.

The maximum pH and minimum titrable acidity was recorded in nungu packed in LDPE 50 micron pouch (P_1), it might be due to more permeability as compared to aluminum foil pouches (P_3) which facilitate more gas exchange resulting in high oxidation and degradation of organic acids. The minimum pH was found in *nungu* packed in aluminum pouches during storage, it might be due to lesser availability of oxygen to fruit. The organic acid, which participate in respiratory process, are not oxidized and hence the acidity remains high.

Nungu stored at 2 ^{o}C (S_2) recorded the maximum pH and minimum titrable acidity during storage, it might be due to low temperatures which slow down the respiration process. The nungu stored in ice box (S_1) recorded minimum pH and maximum titrable acidity at 8th day of storage. The respiration rate and organic acid production were increased with an increase of temperature. This might be a reason for the variation in acidity of *nungu* stored at different cold storage temperatures. These results are in accordance with (Tandal, 2009) in sapota and (Gautam *et al.,* 2003) in mango.

The browning had increasing trend during the storage period of nungu as influenced by different packing material and storage conditions. The probable reason for this could be due to the activation of hydrolytic enzymes such as polyphenoloxidase and peroxidase (Dhillon *et al.,* 2005).

The lowest browning was recorded in *nungu* packed in LDPE 50 micron (P_1) and the highest browning was found in aluminium foil pouches (P_3). The increase in browning of nungu with the progress in storage period might be due to the increase in internal CO_2 in the packages which leads to anaerobic respiration and accumulation of ethanol and acetaldehyde. The LDPE 50 micron pouch is more permeable than aluminium foil pouches and highest gas exchange resulting less accumulation of CO_2 gas.

The nungu stored in cold storage at 2 ^{o}C (S_2) recorded the lowest browning during storage, while the nungu stored in ice box (S_1)

recorded the highest. At higher temperature, less chilling injury was found and this could be result of low chilling injury in nungu stored at 2 ^{o}C temperature compare to icebox.

The organoleptic score for taste, flavour and overall acceptability of nungu had a decreasing trend during storage. The highest organoleptic score for taste, flavour and overall acceptability was recorded for nungu packed in LDPE 50 micron pouch and stored in cold storage at 2 ^{o}C (P_1S_2). It might be due to less change in acidity, high TSS of *nungu* which produce less organic substance having bad taste. The less changes in pH, lower fermentation which produce less organic substance having bad flavour. Due to the highest score of taste and flavour might be the reason for obtaining the highest organoleptic score for overall acceptability.

Conclusion:

Palmyrah tender fruit endosperm is highly nutritive and a good coolent agent, however it's highly fermentable nature is a constraint in large scale production and long term storage. The present experimental study was focused on investigating the effect of packing material and storage conditions on shelf life of palmyrah *nungu*. Among different packing material, Low Density Poly Ethylene 50 micron pouch (P_1) and different storage conditions, cold storage at 2^{o}C (S_2) found superior for long term storage of palmyrah *nungu* and maximum retention of quality and sensory parameters.

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TREATMENTS	TSS (^{o}Brix)				pH				Titrable acidity (%)			
	2nd Day	4th Day	6th Day	8th Day	2nd Day	4th Day	6th Day	8th Day	2nd Day	4 th Day	6th Day	8th Day
PACKING MATERIAL												
(P_1) LDPE 50 Micron	8.86	8.87	8.94	8.83	6.32	6.27	6.23	6.19	0.145	0.209	0.289	0.418
(P_2) HDPE 50 Micron	8.80	8.84	8.91	8.77	6.28	6.23	6.19	6.16	0.209	0.257	0.370	0.483
(P_3) Aluminium Foil Pouches	8.68	8.72	8.78	8.60	6.14	6.02	6.00	5.97	0.370	0.426	0.499	0.595
LSD (P=0.05)	0.105	0.106	0.107	0.105	0.075	0.075	0.074	0.073	0.003	0.004	0.005	0.006
STORAGE CONDITIONS												
(S_1)Ice Box	8.86	8.77	8.82	8.64	6.19	6.11	6.08	6.05	0.322	0.354	0.451	0.579
(S_2) Cold Storage at 2^{o}C	8.89	8.85	8.92	8.80	6.30	6.26	6.22	6.18	0.172	0.236	0.322	0.429
(S_3) Cold Storage at4 ^{o}C	8.79	8.83	8.90	8.77	6.27	6.18	6.16	6.12	0.193	0.258	0.343	0.450
(S_4) Refrigerated Storage (8-10 ^{o}C)	8.74	8.79	8.86	8.71	6.22	6.14	6.12	6.08	0.279	0.344	0.429	0.537
LSD (P=0.05)	NS	NS	NS	NS	0.087	0.086	0.085	0.085	0.004	0.004	0.006	0.007

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INTERACTION OF PACKING MATERIAL x STORAGE CONDITIONS (P x S)												
P_1S_1	8.74	8.82	8.87	8.70	6.25	6.20	6.17	6.13	0.258	0.322	0.386	0.515
P_1S_2	8.96	8.94	9.01	8.94	6.40	6.35	6.30	6.24	0.064	0.129	0.193	0.322
P_1S_3	8.91	8.89	8.99	8.89	6.36	6.30	6.27	6.21	0.064	0.129	0.193	0.386
P_1S_4	8.82	8.85	8.91	8.80	6.28	6.24	6.20	6.17	0.193	0.258	0.386	0.451
P_2S_1	8.71	8.79	8.84	8.67	6.23	6.18	6.14	6.11	0.258	0.322	0.451	0.579
P_2S_2	8.87	8.88	8.97	8.83	6.32	6.27	6.24	6.20	0.129	0.193	0.322	0.451
P_2S_3	8.85	8.90	8.95	8.81	6.30	6.25	6.21	6.19	0.193	0.193	0.322	0.386
P_2S_4	8.79	8.80	8.89	8.76	6.26	6.22	6.19	6.15	0.258	0.322	0.386	0.515
P_3S_1	8.61	8.70	8.77	8.56	6.10	5.95	5.94	5.90	0.451	0.417	0.515	0.644
P_3S_2	8.86	8.74	8.80	8.64	6.19	6.15	6.11	6.09	0.322	0.386	0.451	0.515
P_3S_3	8.63	8.72	8.78	8.61	6.15	6.00	5.99	5.97	0.322	0.451	0.515	0.579
P_3S_4	8.63	8.73	8.78	8.59	6.13	5.97	5.96	5.93	0.386	0.451	0.515	0.644
LSD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	0.006	0.008	0.010	0.012

Table 1: Effect of packing material and storage conditions on physico chemical properties of palmyrah nungu during storage

TREATMENTS	Reducing sugars (%)				Total sugars (%)				Browning (%)			
	2nd Day	4th Day	6th Day	8th Day	2nd Day	4th Day	6th Day	8th Day	2nd Day	4 th Day	6th Day	8th Day
PACKING MATERIAL												
(P_1) LDPE 50 Micron	5.34	5.36	5.41	5.35	8.78	8.70	8.67	8.59	0.017	0.021	0.024	0.026
(P_2) HDPE 50 Micron	5.31	5.33	5.37	5.31	8.55	8.52	8.48	8.41	0.020	0.023	0.027	0.030
(P_3) Aluminium Foil Pouches	5.19	5.23	5.27	5.19	8.50	8.47	8.41	8.36	0.032	0.035	0.041	0.043
LSD (P=0.05)	0.063	0.064	0.064	0.063	0.103	0.103	0.102	0.102	0.001	0.000	0.000	0.000
STORAGE CONDITIONS												
(S_1)Ice Box	5.23	5.26	5.30	5.22	8.52	8.49	8.44	8.37	0.029	0.032	0.037	0.040
(S_2) Cold Storage at 2°C	5.33	5.36	5.39	5.33	8.67	8.64	8.60	8.54	0.018	0.021	0.025	0.028
(S_3) Cold Storage at4 °C	5.30	5.34	5.37	5.31	8.62	8.59	8.53	8.48	0.020	0.024	0.028	0.030
(S_4) Refrigerated Storage (8-10 °C)	5.26	5.29	5.35	5.26	8.56	8.52	8.50	8.40	0.025	0.028	0.033	0.035
LSD (P=0.05)	0.073	0.074	0.074	0.073	NS	NS	NS	NS	0.001	0.000	0.000	0.000
INTERACTION OF PACKING MATERIAL x STORAGE CONDITIONS (P x S)												
P_1S_1	5.28	5.30	5.35	5.27	8.68	8.65	8.60	8.55	0.025	0.028	0.032	0.034

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P_1S_2	5.41	5.43	5.46	5.42	8.78	8.74	8.69	8.62	0.011	0.014	0.017	0.020
P_1S_3	5.38	5.40	5.43	5.39	8.75	8.72	8.70	8.60	0.013	0.018	0.020	0.021
P_1S_4	5.31	5.33	5.39	5.31	8.71	8.69	8.71	8.59	0.020	0.023	0.027	0.029
P_2S_1	5.25	5.28	5.30	5.25	8.49	8.45	8.40	8.31	0.026	0.029	0.035	0.037
P_2S_2	5.35	5.37	5.41	5.36	8.64	8.61	8.58	8.52	0.015	0.017	0.022	0.025
P_2S_3	5.33	5.36	5.40	5.33	8.58	8.56	8.51	8.46	0.018	0.021	0.024	0.026
P_2S_4	5.30	5.31	5.39	5.29	8.51	8.47	8.42	8.34	0.022	0.025	0.029	0.031
P_3S_1	5.15	5.19	5.24	5.15	8.40	8.38	8.34	8.26	0.035	0.039	0.045	0.048
P_3S_2	5.22	5.27	5.29	5.22	8.61	8.58	8.53	8.49	0.029	0.031	0.037	0.039
P_3S_3	5.20	5.25	5.28	5.20	8.55	8.51	8.40	8.39	0.030	0.033	0.039	0.042
P_3S_4	5.18	5.22	5.27	5.18	8.46	8.41	8.39	8.29	0.032	0.036	0.042	0.040
LSD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	0.001	0.001	0.001	0.001

Table 2: Effect of packing material and storage conditions on physico chemical properties of palmyrah nungu during storage

TREATMENTS	Taste				Flavour				Overall Acceptability			
	2nd Day	4th Day	6th Day	8th Day	2nd Day	4th Day	6th Day	8th Day	2nd Day	4 th Day	6th Day	8th Day
P_1S_1	7.00	6.80	5.60	4.80	7.20	6.60	5.60	4.80	7.60	6.00	4.80	3.80
P_1S_2	9.00	8.00	6.80	6.00	8.80	7.80	6.80	6.00	8.80	7.00	6.00	5.00
P_1S_3	8.60	7.80	6.60	5.80	8.20	7.60	6.60	5.80	8.60	6.60	5.80	4.80
P_1S_4	7.40	7.20	6.20	5.20	7.60	7.00	6.00	5.20	8.00	6.40	5.20	4.40
P_2S_1	6.60	6.60	5.40	4.60	7.00	6.40	5.40	4.60	7.40	5.80	4.60	3.60
P_2S_2	8.20	7.60	6.40	5.60	8.00	7.40	6.40	5.80	8.40	6.60	5.60	4.60
P_2S_3	7.80	7.40	6.20	5.40	7.80	7.20	6.20	5.40	8.20	6.40	5.40	4.40
P_2S_4	7.00	7.00	6.00	4.80	7.40	6.80	5.80	5.00	7.80	6.20	5.00	4.00
P_3S_1	5.80	5.40	4.80	3.80	6.20	5.60	4.60	3.80	6.60	5.00	3.80	3.00
P_3S_2	6.40	6.00	5.00	4.40	6.80	6.20	5.20	4.40	7.20	5.60	4.40	3.40
P_3S_3	6.20	5.80	5.00	4.20	6.60	6.00	5.00	4.20	7.00	5.40	4.20	3.20
P_3S_4	6.00	5.40	5.00	4.00	6.40	5.80	4.80	4.00	6.80	5.20	4.00	3.20

Table 3: Effect of packing material and storage conditions on sensory parameters of palmyrah nungu during storage