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# Storability analysis of squash prepared from different mango (*Mangifera indica* L.) cultivars commercially grown in Malda district of West Bengal with reference to quality and organoleptic properties

**B Krishna and AK Banik**

**Abstract**
Six commercially grown Mango cultivars (*i.e.* Himsagar, Kishanbhog, Langra, Amrapali and Lakshmanbhog), in Malda district of West Bengal, India were evaluated for their suitability for squash preparation, storability of the end product. During storage the TSS, reducing sugar and total sugar of squash increased to a detectable extent, while acidity and ascorbic acid content decreased gradually. Overall assessment of quality revealed that with respect to conjugal study of all these parameters squash prepared from the variety Langra proved considerably superior over other varieties with maximum Overall acceptability score of (7.63).

**Keywords:** Cultivars, Malda, mango, overall acceptability, squash, storability

## Introduction
The popularity of Mango (*Mangifera indica* L.), in the international market, is due to its excellent taste, attractive fragrance, beautiful colour, as well as nutritional properties (Arauz, 2000) [1]. In addition, mangoes are good source of ascorbic acid, carotenoids and phenolic compounds and other dietary antioxidants (Talcott *et al*., 2005) [22]. The prominent mango producing countries are India, China, Thailand, Indonesia, Philippines, Pakistan and Mexico (Tharanathan *et al*., 2006) [24]. Maldah, Murshidabad, Nadia and Hooghly are the important mango growing districts of West Bengal, India. Mango is the most important and one of the high potential fruits in Malda. In Malda various mango based processed products have already been commercialized. But these products are either sold locally or adjoining areas. However, only less than 2% of the fresh production of mango is being utilized for making processed products. Hence, there is an urgent need to identify suitable for processing varieties, their performance as per standard processing methodology and storage under perceptible condition. This will obviously stabilize the market price of the fresh materials and growers would be able to get calculated return. Post harvest losses of mango fruits in India are very high i.e. 20 to 30% every year (Saigal, 2001) [19] and these losses can be minimized by utilizing green fruits for making pickle or chutney or as a sundried acidifying condiment (AMCHUR) (Srivastva, 1998) [20]. Several processed foods are prepared from mango in which squash plays an important role which is mainly used during summer season as a beverage (Kumar *et al*., 2018) [14]. Realizing the importance of mango fruits for nutrition, perishable nature, seasonal availability and no indigenous research work on suitability of mango varieties for squash production along with the storability study of the processed products, the present investigation was carried out to assess the varietal suitability of mango for squash preparation and to identify the storage stability of mango squash at ambient temperature.

## Materials and Methods
In the present research work ripe mangoes were collected from ten blocks of Malda Sadar and Chanchal sub-division of Malda district, West Bengal, India. Squash was prepared at the Department of Post-Harvest Technology of Horticultural Crops, Faculty of Horticulture, Bidhan Chandra Krishi Vishwavidyalaya, Mohanpur, Nadia during the period from 2016-17 and 2017-18. The collection centre of mango fruits is situated in the Lower Gangetic Plain Agro Climatic Zone of West Bengal. The soil of the location was clay to loam and it was sufficiently deep. The pH of the soil was slightly acidic to neutral and varied from 6.0 to 6.8.

**Preparation of mango squash**

| | | |
|---|---|---|
| Total Number of varieties (Treatments) | : | 5 (Himsagar, Kishanbhog, Langra, Amrapali and Lakshmanbhog) |
| Stage of fruit | : | Optimum maturity stage (ripe stage) |
| Storage condition | : | Ambient temperature (Room temperature) |
| Packaging | : | Glass bottles (200 ml) |

**Methodology**

The mango fruits of Himsagar, Kishabhog, Langra, Amrpali and Lakshmanbhog varieties were collected from different private mango orchards and Mango Research Station at Malda, West Bengal, India. Fully matured and ripe mango fruits with sound shape, size and free from injured and deteriorated parts were selected for making the squash.

**Extraction of pulp from fruit**

After harvesting, the fruits brought immediately in to the laboratory. After sorting and thorough washing with water, the fruit were subjected to juice extraction. Mango fruits were peeled with the help of stainless steel knives and cut into pieces. These cut pieces were passed through the juicer for extraction of juice/pulp.

**Procedure for preparation of squash**

The extracted juice/pulp was used for the preparation of mango squash. Sugar syrup was prepared to which citric acid was added. Homogenized juice was added to the cooled syrup and mixed thoroughly. The Potassium metabisulphite @ 600 ppm was used as preservative for the prepared squash. The squash was than filled in sterilized glass bottles (200ml capacity) and sealed. It is diluted before serving.

**Recipe for mango squash**

| Sl. No. | Ingredients | | Quantity |
|---|---|---|---|
| 1 | Juice | : | 1 litre |
| 2 | Sugar | : | 1.50 kg |
| 3 | Citric acid | : | 8 g |
| 4 | Potassium Metabisulphite | : | 0.06% |
| 5 | Water | : | 0.750 litre |

**Observations recorded**

During the period of study, observation on TSS (ºBrix), Total sugars (%), Reducing sugars (%), Acidity (%), pH, ascorbic acid (mg/100 g), organoleptic evaluation and microbial count in processed product were assessed at initial day of storage as well as 30$^{th}$, 60$^{th}$, 90$^{th}$, 120$^{th}$, 150$^{th}$ and 180$^{th}$ day of storage.

**Statistical Analysis**

For analysing the influence of varietal differences and storage intervals on the quality of value added mango (*Mangifera indica* L.) product (i.e. squash) of Malda district, the experiment was laid out in two factors Completely Randomized Design (CRD) with three replications. The varietal effects were taken as the first factor and the influence of storage intervals were considered as the second factor during the statistical analysis. The data relating to quality attributes of the processed mango products recorded during the period of experimentation were statistically analyzed by following analysis of variation method using MSTAT software. For inference 5% level of significance of 'F' and 't' test were applied.

**Results and Discussion**

The influence of duration of storage on the quality of squash prepared from various mango varieties had been described on the light of TSS content, acidity percentage, pH level, reducing and total sugar content, overall acceptability score and microbial load.

**Influence on TSS content**

TSS content of squash prepared from different varieties of mango namely, Himsagar, Kishenbhog, Langra, Amrapali and Lakshmanbhog revealed remarkable variations under the sole influence of varietal differences (Table 1). The highest and lowest TSS content of squash of 43.99$^0$Brix and 401.93$^0$Brix had been recorded from varieties Kishan bhog and Lakshman bhog, respectively.

Considerable differences in TSS content of squash prepared from various mango cultivars also had been reported by Kumar *et al*. (2018) [14], who investigated on squash prepared form Dasherhari, Langra, S. B. Chousa and Amrapali. Similarly, the effect of storage duration also showed statistical variations over the TSS content of squash in the present investigation (Table 1). The data represented in the table indicate a gradual increase in TSS content of squash from 0 DAS to 180 DAS. At initial stage the TSS content was recorded as 37.42$^0$Brix and it varied considerably from TSS content detected during all the other storage intervals. The highest TSS content (47.04$^0$Brix) was recorded at 180 DAS. Similar trend in change of TSS during storage period was observed in the present study, was found in Karonda squash (Deen and Singh, 2012) [5] and in blended squash of mango and *Aloe vera* (Chaudhary *et al*., 2017) [3]. The increase in TSS content with the increase in storage period, irrespective of cultivars, might possibly be due to partial hydrolysis of polysaccharides like cellulose, starch and pectic substances into simple soluble substances. However, the effect of integration of variety and storage interval could not show any mentionable differences over the TSS content of squash in the present investigation (Table 1).

**Influence on acidity percentage**

Cultivar diversity, in mango squash making, exerted prominent variation over acidity level of squash which varied from 1.05% [Langra] to 0.91% [Amrapali] (Table 2). During assessment of varietal suitability for squash making Hussain *et al*. (2005) [8] also visualized considerable variation in acidity of squash prepared from different mango varieties. The differences in the level of acidity of raw mango pulp of various mango accessions might have created the variation in acidity levels of squash prepared from different mango cultivars. With regards to the effect of storage duration on acidity of squash, a gradual decreasing trend was visualized during the subsequent increase in storage intervals (Table 2). This reduction in acidity with the increase in storage period might be due to hydrolysis of polysaccharides and non-reducing sugars in the presence of organic acid. As confirmatory evidence to the outcome of the present study, the reduction in the acidity of squash during storage was also reported by Kannan and Thirumaran (2001) [11] and they also opined that the reduction in acidity during storage might be due to chemical reactions taken place between organic acids and pigments. The influence of interaction of variety and storage duration could able to create significant variations on the acidity level of mango squash (Table 2). The highest and lowest acidity percentage of squash had been registered from

variety Langra at 0 DAS and Amrapali at 180 DAS, respectively and values were registered as 1.265% and 0.76%.

**Influence on pH**

The pH level of squash prepared from different varieties i.e. Himsagar, Kishanbhog, Langra, Amrapali and Lakshmanbhog revealed significant difference between the varieties (Table 3). The maximum pH (3.19) was registered in squash prepared from Amrapali and the lower pH (2.82) in Langra. The difference in acidity level of raw mango pulp of different varieties might have played it's part in creating significant differences in pH of squash, as these parameters acidity level and pH are inversely related to each other. The variation of pH level in nectar prepared from different mango varieties were also seen in the research findings of Patel *et al*. (2018) [17], who used Langra, Amrapali, Totapuri, Neelum and Neeleshan varieties of mango for squash preparation. Under the particular influence of storage interval, the pH values of squash varied considerably. In contrast to the acidity level of the product, the pH level increased with the progress of storage interval (Table 3). The minimum pH value of 3.02 was registered at the initial stage, whereas it was the maximum as 4.65 at 180 DAS. A reversed trend between pH and acidity of mixed fruit squash had also been observed by Jothi *et al*. (2014) [10]. Similar results were also found by Karmoker *et al*. (2010 and 2011) [13, 12]. The continuous increase in acid hydrolysis of polysaccharides, especially gums and pectin might have created more acidic environment in the processed products during storage, which might have played significant role in reduction in pH value of squash during advancement of storage intervals. However, insignificant variation in pH level of squash was seen due to the combined influence of mango cultivar and storage intervals (Table 3).

**Influence on reducing sugar content**

Reducing sugar content of squash exhibited tangible variations due to the difference in varieties in the present study (Table 4). The highest value (18.74%) in this respect was registered for variety Himsagar. Similar influence of various mango genotypes on the reducing sugar content of squash had been reported by Hamed (1966) [6], Saeed and Abu-Sin (1971) [18] and Home *et al*. (1997) [7]. The reducing sugar content of raw mango pulp and related chemical reactions between different parameters might have attributed to the variation in reducing sugar content of squash in the present experiment. The quantity of reducing sugar content in squash increased gradually and significantly in connection to storage intervals (Table 4). The lowest reducing sugar content (16.77%) during 0 DAS was increased to 19.36% at 180 DAT. This might be associated with low level of TSS in squash caused to less availability of polysaccharides, which were readily converted into the reducing sugar during storage. Jain *et al*. (2007) [9] had also observed that the reducing sugars of aonla nectar increased continuously during storage. The conjugal influence of mango genotypes and storage period failed to differentiate the reducing sugar contents of squash in a significantly way (Table 4).

**Influence on total sugar content**

The mango squash prepared from varieties such as Himsgar, Kishanbhog, Langra, Amrapali and Lakshmanbhog expressed statistical differences with respect to total sugar content (Table 5). The best value for this parameter was measured for the cultivar Himsagar (47.59%). The diversified nature of mango cultivars and difference in sugar content at ripening stage might have resulted in the variation of total sugar content in squash prepared by using various varieties of mango. Significant variation in total sugar content in mango squash due to use of different varieties (i.e. Dashehari, Langra, S. B. Chousa and Amrapali) also had been reported by Kumar (2018) [14]. The amount of total sugar content of squash increased in a significant manner under the influence of storage interval from 0 DAS to 180 DAS (Table 5). During the initial stage it was recorded as 43.62% and subsequently at 30, 60, 90, 120, 150 and 180 DAS, it was obtained as 44.29%, 44.76%, 45.08%, 45.64%, 46.06% and 46.46%, respectively. This increase in total sugar in mango squash during storage was probably due to the conversion of polysaccharides into sugar. The trend of increase in the total sugar content of mango squash during storage also had been confirmed from the investigation of Mishra *et al*. (2017) [15] in Mango-Aloe blended squash. Similar observations were also observed in phalsa squash by Waskar and Kurdia (1987) [26], in bael and guava blended squash by Nidhi *et al*. (2007) [16] and in Karonda squash by Deen and Singh (2012) [5].

**Influence on ascorbic acid content**

Individual influence of mango cultivars proved efficient enough to raise significant variation in the ascorbic acid content of mango squash (Table 6). The variety Langra imparted the maximum ascorbic acid content in squash (5.49 mg/100 ml). The significant difference in ascorbic acid content in squashes that prepared from different varieties of mango also had been advocated by Bender (1958) [2]. The inherent nature of the mango cultivars would have created this variation in ascorbic acid content of squash under the present experiment. Ascorbic acid content in squash also showed statistical variation under the sole influence of storage duration (Table 6). It revealed a negative relationship with the duration of storage. The view of present result, with respect the reduction in ascorbic acid content under storage of squash, was consistent with the research findings of Nidhi *et al*. (2007) [16] in bael and guava blended squash, Das (2009) [4] in jamun squash, Zulfakar *et al*. (2011) [28] in seabuckthorn berries squash and Deen and Singh (2012) [5] in Karonda squash. However, the effect of interaction of mango cultivar and storage intervals could not show any considerable differences in the ascorbic acid content of mango squash (Table 6).

**Influence on overall acceptability**

The assessment of overall acceptability of squash under the sole and integrated influences mango variety and storage duration was done on the basis of conjugal evaluation of taste, flavour and colour. The maximum overall acceptability score after entire judgement had been gathered by squash prepared from Langra variety of mango [7.63], whereas the minimum score in this regard had been shown by the squash prepared with Lakshmanbhog variety (Table 7). Keeping near similarity to present study the effect of mango varieties on the acceptability of squash also had been reported by Kumar *et al*.(2018) [14], while working with mango varieties Dashehari, Langra, S. B. Chousa and Amrapali. The steady decrease in the overall acceptability values had been visualized during storage of mango squash (Table 7). At the initial stage, it was recorded as 8.57 and after a storage period of 180 days it was decreased to 8.35. The gradual reduction in overall

acceptability of squash in the present study might be due to the consistent increase in acidity and sugar content and decrease in pH and ascorbic acid content in the end product. The significant reduction in the organoleptic acceptability of squash with increase in storage period also got sufficient support from the experimental findings of Thakur and Barwal (1998) [23], Jothi *et al*. (2014) [10] and Yadav *et al*. (2015) [27] in kiwi fruit squash, mixed fruit squash and guava-mango blended squash, respectively. The interaction of mango varieties and different storage duration exerted insignificant effect over acceptability score mango squash (Table 7). The highest content of acidity and ascorbic acid along with fairly high level of TSS and reducing sugar in variety Langra might have resulted into the best quality squash prepared from this variety. It was closely followed by the variety Amrapali, which achieved the second highest acceptability score for squash.

**Influence on microbial load**

Three types of colony forming units of bacterial population had been measured under the present study i.e. $10^4$, $10^5$ and $10^6$. Form the initial stage to 60 DAS, except squash prepared from Fazli and Kinshanbhog variety, no bacterial growth had been detected for any other variety (Table 8). The rapid growth of bacterial colony was seen from 120 DAS to 150 DAS. Fungal colony was detected in the forms of $10^2$, $10^3$ and $10^4$ in the present study (Table 9). The notable fact here is that the squash prepared from Langra variety of mango showed practically no fungal growth upto 90 DAS and it also revealed very less growth upto 120 DAS. On the other hand, varieties like Kisanbhog and Fazli showed initiation fungal colony formation comparatively much earlier during storage. At 180 DAS the maximum fungal colony forming units had been shown by Fazli squash and the values were 15.00 X $10^2$, 11.00 X $10^3$ and 6.00 X $10^4$, whereas these values were counted as the minimum for Langra (6.00 X $10^2$, 4.00 X $10^3$ and 3.00 X $10^4$). The gradual increase in the population of microorganisms in the form of bacteria, fungus, moulds and yeasts etc. also had been visualized by Jothi *et al*. (2014) [10], while their study with mixed fruit squash. The higher acidity level and lower pH status of squash prepared from Langra variety of mango might have played a significant role in delayed and comparative lesser growth of microorganisms in squash during storage. However, the interactions of mango variety and intervals of storage resulted into insignificant variation with respect to the statue of microbial load in squash in the present investigation (Table 5).

**Table 1:** TSS ($^0$Brix) content of squash as influenced under the sole and interaction effects of varietal differences mango (*Mangifera indica* L.) and various storage durations

| Cultivars (V) | Storage interval days (D) | | | | | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | 0 | 30 | 60 | 90 | 120 | 150 | 180 | |
| Himsagar | 36.69 | 38.81 | 41.22 | 41.95 | 42.85 | 44.87 | 46.51 | 41.84 |
| Kishan bhog | 39.23 | 40.36 | 42.63 | 44.87 | 45.08 | 47.61 | 48.15 | 43.99 |
| Langra | 38.16 | 39.82 | 42.42 | 43.66 | 44.89 | 46.36 | 47.81 | 43.30 |
| Amrapali | 37.84 | 39.31 | 41.91 | 42.87 | 43.38 | 45.96 | 47.33 | 42.66 |
| Lakshman bhog | 35.19 | 38.27 | 40.40 | 41.01 | 42.13 | 44.13 | 45.38 | 40.93 |
| Mean | 37.42 | 39.31 | 41.72 | 42.87 | 43.67 | 45.79 | 47.04 | |

| Particulars | Variety (V) | Storage duration (D) | Variety X Storage duration (V X D) |
|---|---|---|---|
| S.Em. (±) | 0.320 | 0.378 | 0.846 |
| C.D. at 5% level | 0.904 | 1.069 | N.S. |

**Table 2:** Acidity (%) of squash as influenced under the sole and interaction effects of varietal differences of mango (*Mangifera indica* L.) and various storage duration

| Cultivars (V) | Storage interval days (D) | | | | | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | 0 | 30 | 60 | 90 | 120 | 150 | 180 | |
| Himsagar | 1.18 | 1.14 | 1.02 | 0.94 | 0.89 | 0.85 | 0.80 | 0.97 |
| Kishan bhog | 1.11 | 1.06 | 0.99 | 0.94 | 0.89 | 0.82 | 0.78 | 0.94 |
| Langra | 1.26 | 1.22 | 1.11 | 1.06 | 0.98 | 0.91 | 0.84 | 1.05 |
| Amrapali | 1.06 | 1.03 | 0.95 | 0.88 | 0.84 | 0.84 | 0.76 | 0.91 |
| Lakshman bhog | 1.21 | 1.19 | 1.06 | 1.00 | 0.96 | 0.89 | 0.82 | 1.02 |
| Mean | 1.16 | 1.13 | 1.03 | 0.96 | 0.91 | 0.86 | 0.80 | |

| Particulars | Variety (V) | Storage duration (D) | Variety X Storage duration (V X D) |
|---|---|---|---|
| S.Em. (±) | 0.006 | 0.007 | 0.015 |
| C.D. at 5% level | 0.016 | 0.019 | 0.042 |

**Table 3:** pH of squash as influenced under the sole and interaction effects of varietal differences of mango (*Mangifera indica* L.) and various storage durations

| Cultivars (V) | Storage interval days (D) | | | | | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | 0 | 30 | 60 | 90 | 120 | 150 | 180 | |
| Himsagar | 3.07 | 3.26 | 3.65 | 3.98 | 4.14 | 4.32 | 4.59 | 3.86 |
| Kishan bhog | 3.12 | 3.40 | 3.75 | 4.04 | 4.31 | 4.66 | 4.78 | 4.01 |
| Langra | 2.82 | 3.01 | 3.26 | 3.53 | 3.70 | 4.03 | 4.41 | 3.54 |
| Amrapali | 3.19 | 3.38 | 3.81 | 4.12 | 4.43 | 4.64 | 4.91 | 4.07 |
| Lakshman bhog | 2.88 | 3.09 | 3.36 | 3.72 | 3.96 | 4.23 | 4.55 | 3.68 |
| Mean | 3.02 | 3.23 | 3.57 | 3.88 | 4.11 | 4.38 | 4.65 | |

| Particulars | Variety (V) | Storage duration (D) | Variety X Storage duration (V X D) |
|---|---|---|---|
| S.Em. (±) | 0.071 | 0.085 | 0.189 |
| C.D. at 5% level | 0.202 | 0.239 | N.S. |

**Table 4:** Reducing sugar (%) content of squash as influenced under the sole and interaction effects of varietal differences of mango (*Mangifera indica* L.) and various storage durations

| Cultivars (V) | Storage interval days (D) | | | | | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | 0 | 30 | 60 | 90 | 120 | 150 | 180 | |
| Himsagar | 17.65 | 17.99 | 18.22 | 18.57 | 19.29 | 19.62 | 19.81 | 18.74 |
| Kishan bhog | 16.57 | 16.86 | 17.29 | 17.65 | 18.04 | 18.96 | 19.27 | 17.81 |
| Langra | 17.33 | 17.56 | 17.84 | 18.46 | 19.09 | 19.38 | 19.64 | 18.47 |
| Amrapali | 16.29 | 16.68 | 17.02 | 17.49 | 17.97 | 18.75 | 19.17 | 17.62 |
| Lakshman bhog | 16.03 | 16.51 | 16.82 | 17.06 | 17.35 | 18.32 | 18.92 | 17.29 |
| Mean | 16.77 | 17.12 | 17.44 | 17.85 | 18.35 | 19.01 | 19.36 | |

| Particulars | Variety (V) | Storage duration (D) | Variety X Storage duration (V X D) |
|---|---|---|---|
| S.Em. (±) | 0.174 | 0.206 | 0.461 |
| C.D. at 5% level | 0.493 | 0.583 | N.S. |

**Table 5:** Total sugar (%) content of squash as influenced under the sole and interaction effects of varietal differences of mango (*Mangifera indica* L.) and various storage durations

| Cultivars (V) | Storage interval days (D) | | | | | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | 0 | 30 | 60 | 90 | 120 | 150 | 180 | |
| Himsagar | 45.54 | 46.92 | 47.31 | 47.77 | 48.13 | 48.54 | 48.95 | 47.59 |
| Kishan bhog | 43.79 | 44.35 | 44.89 | 45.41 | 45.77 | 46.34 | 46.71 | 45.20 |
| Langra | 42.97 | 43.44 | 43.91 | 44.45 | 44.82 | 45.16 | 45.63 | 44.34 |
| Amrapali | 44.88 | 45.24 | 45.82 | 46.27 | 46.69 | 47.03 | 47.38 | 46.19 |
| Lakshman bhog | 40.94 | 41.52 | 41.89 | 42.36 | 42.80 | 43.23 | 43.64 | 42.34 |
| Mean | 43.62 | 44.29 | 44.76 | 45.08 | 45.64 | 46.06 | 46.46 | |

| Particulars | Variety (V) | Storage duration (D) | Variety X Storage duration (V X D) |
|---|---|---|---|
| S.Em. (±) | 0.354 | 0.418 | 0.936 |
| C.D. at 5% level | 1.000 | 1.183 | N.S. |

**Table 6:** Ascorbic acid (mg/100 ml) content of squash as influenced under the sole and interaction effects of varietal differences of mango (*Mangifera indica* L.) and various storage durations

| Cultivars (V) | Storage interval days (D) | | | | | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | 0 | 30 | 60 | 90 | 120 | 150 | 180 | |
| Himsagar | 5.69 | 5.57 | 5.37 | 5.09 | 4.69 | 4.28 | 4.07 | 4.97 |
| Kishan bhog | 5.54 | 5.35 | 5.04 | 4.88 | 4.58 | 4.17 | 3.94 | 4.79 |
| Langra | 6.27 | 6.18 | 5.87 | 5.39 | 5.17 | 4.98 | 4.59 | 5.49 |
| Amrapali | 5.91 | 5.75 | 5.51 | 5.13 | 4.74 | 4.39 | 4.18 | 5.09 |
| Lakshman bhog | 6.14 | 6.03 | 5.62 | 5.26 | 4.91 | 4.54 | 4.36 | 5.27 |
| Mean | 5.91 | 5.78 | 5.48 | 5.15 | 4.82 | 4.47 | 4.23 | |

| Particulars | Variety (V) | Storage duration (D) | Variety X Storage duration (V X D) |
|---|---|---|---|
| S.Em. (±) | 0.038 | 0.045 | 0.101 |
| C.D. at 5% level | 0.108 | 0.128 | N.S. |

**Table 7:** Overall acceptability score of squash as influenced under the sole and interaction effects of varietal differences of mango (*Mangifera indica* L.) and various storage durations

| Cultivars (V) | Storage interval days (D) | | | | | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | 0 | 30 | 60 | 90 | 120 | 150 | 180 | |
| Himsagar | 7.76 | 7.71 | 7.67 | 7.60 | 7.54 | 7.51 | 7.49 | 7.61 |
| Kishan bhog | 7.64 | 7.60 | 7.56 | 7.50 | 7.45 | 7.41 | 7.38 | 7.51 |
| Langra | 7.76 | 7.72 | 7.68 | 7.63 | 7.58 | 7.53 | 7.49 | 7.63 |
| Amrapali | 7.71 | 7.65 | 7.61 | 7.56 | 7.52 | 7.47 | 7.44 | 7.57 |
| Lakshman bhog | 7.60 | 7.56 | 7.51 | 7.47 | 7.42 | 7.39 | 7.36 | 7.47 |
| Mean | 7.69 | 7.65 | 7.61 | 7.55 | 7.50 | 7.46 | 7.43 | |

| Particulars | Variety (V) | Storage duration (D) | Variety X Storage duration (V X D) |
|---|---|---|---|
| S.Em. (±) | 0.021 | 0.025 | 0.055 |
| C.D. at 5% level | 0.059 | 0.070 | N.S. |

**Table 8:** Bacterial population (cfu/ml) as detected in squash under the sole influence and interaction effects of varietal differences of mango (*Mangifera indica* L.) and various storage durations

| Cultivars (V) | Storage interval days (D) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Initial | | | 30 | | | 60 | | | 90 | | | 120 | | | 150 | | | 180 | | |
| | Type of C.F.U. | | | Type of C.F.U. | | | Type of C.F.U. | | | Type of C.F.U. | | | Type of C.F.U. | | | Type of C.F.U. | | | Type of C.F.U. | | |
| | $10^4$ | $10^5$ | $10^6$ | $10^4$ | $10^5$ | $10^6$ | $10^4$ | $10^5$ | $10^6$ | $10^4$ | $10^5$ | $10^6$ | $10^4$ | $10^5$ | $10^6$ | $10^4$ | $10^5$ | $10^6$ | $10^4$ | $10^5$ | $10^6$ |
| Himsagar | ND | ND | ND | ND | ND | ND | 2.00 | ND | ND | 7.00 | 6.00 | 2.00 | 15.00 | 13.00 | 6.00 | 27.00 | 22.00 | 15.00 | 36.00 | 29.00 | 21.00 |
| Kishan bhog | ND | ND | ND | ND | ND | ND | 3.00 | 2.00 | ND | 5.00 | 4.00 | 1.00 | 10.00 | 9.00 | 3.00 | 18.00 | 15.00 | 9.00 | 24.00 | 21.00 | 16.00 |
| Langra | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 4.00 | 2.00 | 1.00 | 14.00 | 17.00 | 5.00 |
| Amrapali | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 6.00 | 3.00 | 1.00 | 12.00 | 8.00 | 4.00 | 19.00 | 14.00 | 11.00 |
| Lakshman bhog | ND | ND | ND | ND | ND | ND | ND | ND | ND | 5.00 | 3.00 | ND | 16.00 | 13.00 | 5.00 | 23.00 | 22.00 | 17.00 | 31.00 | 24.00 | 18.00 |

ND – Not Detected, C.F.U. – Colony Forming Unit

**Table 9:** Fungal population (cfu/ml) as detected in squash under the sole influence and interaction effects of varietal differences of mango (*Mangifera indica* L.) and various storage durations

| Cultivars (V) | Storage interval days (D) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Initial | | | 30 | | | 60 | | | 90 | | | 120 | | | 150 | | | 180 | | |
| | Type of C.F.U. | | | Type of C.F.U. | | | Type of C.F.U. | | | Type of C.F.U. | | | Type of C.F.U. | | | Type of C.F.U. | | | Type of C.F.U. | | |
| | $10^2$ | $10^3$ | $10^4$ | $10^2$ | $10^3$ | $10^4$ | $10^2$ | $10^3$ | $10^4$ | $10^2$ | $10^3$ | $10^4$ | $10^2$ | $10^3$ | $10^4$ | $10^2$ | $10^3$ | $10^4$ | $10^2$ | $10^3$ | $10^4$ |
| Himsagar | ND | ND | ND | ND | ND | ND | ND | ND | ND | 4.00 | ND | ND | 9.00 | 3.00 | 2.00 | 14.00 | 9.00 | 6.00 | 19.00 | 15.00 | 11.00 |
| Kishan bhog | ND | ND | ND | ND | ND | ND | 3.00 | ND | ND | 5.00 | 2.00 | 1.00 | 6.00 | 2.00 | 2.00 | 11.00 | 8.00 | 5.00 | 18.00 | 10.00 | 9.00 |
| Langra | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 6.00 | ND | ND | 3.00 | 2.00 | 1.00 | 6.00 | 4.00 | 3.00 |
| Amrapali | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.00 | ND | ND | 4.00 | 2.00 | ND | 7.00 | 5.00 | 3.00 | 11.00 | 9.00 | 7.00 |
| Lakshman bhog | ND | ND | ND | ND | ND | ND | ND | ND | ND | 5.00 | ND | ND | 7.00 | 4.00 | 2.00 | 12.00 | 7.00 | 5.00 | 15.00 | 11.00 | 6.00 |

ND – Not Detected, C.F.U. – Colony Forming Unit

## Conclusion

The overall assessment revealed that the quality parameters of squash (i.e. TSS, reducing sugar, total sugar and ascorbic acid content and acidity and pH status) were maintained at a considerably higher level, when it was prepared of Langra variety. Similar impact was also shown in case of overall acceptability score. Most of these attributes were seen at a lower side in squash prepared of Lakshmanbhog variety. Whereas, the minimum microbial growth could be seen in Langra squash, which was found at the highest level in case of squash prepared from Amrapali variety. During storage the TSS, reducing sugar and total sugar was increased upto a detectable extent, but acidity and ascorbic acid content decreased gradually.

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