

Development of strawberry jam and its quality evaluation during storage

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Abstract: The present study was conducted to develop a strawberry jam and to evaluate its quality parameters during storage. The research work was carried out at Food Technology Centre of PCSIR Labs Complex Peshawar. Fresh, healthy and mature fruits were sorted, washed and pieces were made with the help of stainless steel knife and dipped in 0.2 % citric acid solution to avoid browning. The fruit pieces were cooked into the open steel kettle and cooked till the required brix (68°brix). Fruit jam was allowed to cool and stored in sterilized glass jars for sixty days. The physicochemical analysis such as TSS, pH, acidity (%), sugar acid ratio, reducing sugar and non reducing sugar were studied at an interval of 15 days for a total period of sixty days. The Strawberry jam was also organoleptically evaluated by a panel of 10 experienced judges using Nine Point Hedonic Scale. Results showed that the values of TSS (°brix), acidity (%), pH, sugar acid ratio and non reducing sugar (%) significantly decreased from 66.5, 0.68, 3.20, 97.79, 28.11 to 68.6, 0.86, 2.91, 80 and 25.24 respectively during sixty days of storage while reducing sugar increased from 42.58 to 45.32 %. The organoleptic evaluation shows that the values of colour, taste and overall acceptability also decreased from 9.0 to 7.0, 7.1 and 7.0 respectively during storage. From the overall results it is concluded that the prepared strawberry jam is of good quality and has maximum consumer acceptance.

Keywords: Strawberry jam, quality evaluation, storage, TSS, sugar acid ratio.

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INTRODUCTION

Strawberry (*Fragaria ananassa*) is a herbaceous perennial member of the family "Rosaceae", which is grown in many countries of the world, but it is cultivated extensively in USA, Japan, Mexico, Italy and Lebanon. The fruit is firm, red fleshed and sweet. More than 50% of the sucrose in strawberries is glucose. The fruit contains mostly citric acid and some malic acid. The red colour of the fruit is due to an anthocyanin pigment. Many volatile esters responsible for the flavor of the fruit are present in it¹. The strawberry fruit is gaining wide range of popularity in Pakistan and mostly imported from western countries. It is known as non-climatic fruit of frequent human consumption. In Pakistan its cultivation is gradually increased due to its bright scope in future for the farmers as the fruit can return maximum economic benefit to the farmers².

Nutritionally, strawberry contains low calorie carbohydrate and a potential source of vitamin C, fibers and provides more vitamin C than oranges. The Vitamin C in strawberry is (64.0mg), water (91.75g), protein (0.61g), fat (0.37g), carbohydrate (7.02g), fibre (2.3g), calcium (14.0mg), potassium (166.0 mg/160g) and vitamin-A 27IU³. Jam made from different types of fruits are a popular food items among the local population. It is usually prepared from cooked fruit or vegetable, sugars, citric acid and pectin⁴.

Being a soft textured fruit a little fluctuation in a temperature results in spoilage and wastage of fruit. Due to lack of other preservation facilities to preserve the product in raw form, this study has been initiated to utilize the very perishable fruit in the form of jam. This will offer high income return

to growers as well as to fruit processing industries which will improve the economy of Pakistan.

MATERIALS AND METHODS

Collection of sample

Fresh, mature and healthy strawberry fruits were purchased from the fruit market of Peshawar and transported in corrugated soft board cartons to the Food Technology Centre, PCSIR Labs Complex Peshawar. After washing and sorting the fruit pieces were made with the help of stainless steel knife and dipped in 0.2 % citric acid solution already prepared to avoid browning.

Preparation of jam

Jam was prepared according to the formula and method of Awan and Rehman (1999)⁵. The jam samples were cooked into the open steel kettle. The mixture was cooked till the required brix (68°brix). Fruit jam was allowed to cool and packed in sterilized glass jars.

Physicochemical analysis

The physicochemical analysis of the jam such as pH, total soluble solids, acidity (%), sugar acid ratio, reducing sugar and non reducing sugar were carried out using the recommended methods of AOAC (2000)⁶. The jam samples were also organoleptically evaluated for colour, taste and overall acceptability by a panel of 10 experienced judges using Nine Point Hedonic Scale as described by Larmond (1977)⁷.

RESULTS AND DISCUSSION

The data on physico chemical analysis and organoleptic characteristics is shown in table 1. Results showed that initially the TSS content of the jam was 66.5 which gradually increased to 68.8

during 60 days of storage. These results are in accordance with Tremazi (1967)⁸ who reported that total soluble solids increased in canned Pakistani peaches on storage. Ehsan et al. (2002)⁹ and Ehsan et al. (2003)¹⁰ reported the increase in TSS of watermelon and lemon Jam from 68.6 to 68.9 and grape fruit apple marmalade from 70.0 to 70.8 after 60 days.

The results pertaining to the titratable acidity revealed that acidity increased from 0.68 to 0.86 % during storage. Ehsan et al. (2002)⁹ Torezan (2002) also reported increase in acidity during storage of jam. Table shows that the pH values of the jam decreased from 3.20 to 2.91 during storage. These results are in agreement with (Ayub et al., 2010)² who reported decreasing trend in pH of all jams.

The values of sugar acid ratio decreased from 97.79 to 80 during sixty days of storage. The sugar concentration (°Brix) and acidity are usually consumer's satisfactory indices in many fruit products. The ratio is also a better indicator of acceptability than either sugar or acid alone¹¹. In the present study the titratable acidity and TSS increased during storage, as a result the sugar acid ratio decreased from time to time, which is also in accordance to Gorini and Lasorella (1990)¹².

Sugars are the most important constituent of fruit product and are essential factor for the flavor of the food product and also act as a natural food preservative². Results showed that reducing sugar increased gradually from 42.58 to 45.32 % during sixty days of storage. These results are in agreement with Ruiz-Nieto et al. (1997)¹³ who showed an increase in glucose and fructose contents in strawberry fruits during storage.

The storage had significant effect on the non reducing sucrose of the jam during sixty days of storage. The non reducing sugar decreased in jam samples from 28.11 to 25.14 % during the storage period. These results are confirmed by Ruiz-Nieto et al. (1997)¹³ who suggested that sucrose content of

the fruit in jam converted to glucose and fructose during the storage.

The analysis of our data showed that storage period had a significant effect on color, taste and overall acceptability of the strawberry jam. The values of the colour, taste and overall acceptability decreased significantly from 9.0 to 7.0, 7.1 and 7.0 respectively.

CONCLUSION

The findings of this study show that the product is of good quality and has maximum consumer acceptance. Therefore strawberry fruit can be utilized and preserved in the form of jam. So that the growers can get maximum benefits of their produce.

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Table 1: Physicochemical and organoleptic characteristics of strawberry jam during storage.

Parameters	Storage intervals (Days)					Means
	Initial	15	30	45	60	
TSS	66.5	67.1	67.8	68.4	68.8	67.72
Acidity (%)	0.68	0.70	0.75	0.81	0.86	0.76
pH	3.20	3.12	3.04	2.96	2.91	3.04
Sugar acid ratio	97.79	95.85	90.40	84.44	80.00	89.69
Reducing sugar	42.58	43.86	44.12	44.67	45.32	44.12
Non reducing sugar	28.11	27.63	27.18	26.45	25.14	26.90
Color	9.0	8.4	8.0	7.4	7.0	7.96
Taste	9.0	8.5	8.2	7.6	7.1	8.06
Overall acceptability	9.0	8.2	7.5	7.2	7.0	7.78

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