

STORAGE IMPACT ON THE QUALITY OF RASPBERRY AND PEACH JAMS

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Abstract

The aim of this study is to evaluate the quality properties of raspberry and peach jams during storage. Jams were prepared with a reduced amount of sucrose, citric acid and low-esterified pectin with the addition of calcium ions in the form of calcium citrate. Physico-chemical parameters, such as total dry matter, soluble solids, sugars, total acids, pH, vitamin C, fats, proteins and ash after storage of 15 and 90 days were tested. The jams were exposed to microbiological analysis also.

Results showed that the values of ash, fats and vitamin C were not changed regardless the storage period of the analysed raspberry and peach jams. The period of storage increased the values of total dry matter from 44.97% to 45.86%, soluble solids from 40.17 °Brix to 41.5 °Brix and total acids from 1.47% to 1.49% in raspberry jam. In peach jam these results changed from 42% to 44.1%, from 41.92 °Brix to 42.9 °Brix, and from 0.92% to 0.97% respectively. Microbiological examinations indicate that jams are microbiologically proper according to standards.

From the overall results it can be concluded that the storage period has effect on the prepared raspberry and peach jams, but their quality remains good and has maximum consumer acceptance.

Keywords: *Raspberry jam, Peach jam, Quality properties, Storage period.*

1. Introduction

Fruits are important source of energy for human beings with availability only during specific season. People of all age groups liked them. Due to high water or juice

contents, they are perishable. Preparation of juice, jam, jelly, marmalade etc. increase the shelf life of fruits allowing access to consumers all year round.

Jam is made by boiling fresh, frozen or chemically half-processed canned fruit by adding sugar, pectin and acid. The adequate texture requires a correct combination of each components. The main feature of this product is that it contains fruit pieces in an even gel substance, without separating the fruit juice [1].

Jams can last for extremely long periods of time. Several types of jams have been studied with regard to the influence of storage time on their quality. Muhamed *et al.* [2] prepared mango jams from different mango varieties and analyzed for physicochemical, microbial and sensory parameters at 30 days storage interval for 150 days. It was concluded that good quality mango jam from different mango varieties could be prepared and stored at ambient temperature for 150 days with minimum damage to the product quality.

Rehman *et al.* [3] evaluated the quality of strawberry jam during storage. The physico-chemical analysis were studied at interval of 15 days for a total period of sixty days. The jam samples were also organoleptically evaluated. The evaluation showed that the prepared strawberry jam was of good quality and had maximum consumer acceptance. Imtiaz and Iftikhar [4] used indigenous varieties of apricot and apple to made jams with different formulation. These formulations were stored for 60 days at ambient temperature, and evaluated for chemical and organoleptic properties. The results showed that all the formulations remained acceptable for 60 days at ambient temperature.

Vidhya and Anandhi [5] studied fruit bar and jam from wood apple and compared their quality parameters during different periods of storage up to 90 days. The storage stability was good in both jam and fruit bar with respect to flavour and consistency and they were safe and fit for consumption. Another study [6] focused on the quality attributes of stored Roselle jam from dark and light red varieties. The jams were stored at ambient and cold temperatures and at two weeks interval they were evaluated for pH, titratable acidity, Vitamin C, ash, dry matter, moisture content and sensory properties for a period of six weeks. It was found that prepared Roselle jams stored for six weeks at ambient and cold temperatures were still acceptable.

In Macedonia many fruits are grown. Although most of them are marketed fresh, they can be used to make jams. This study attempted to produce raspberry jam and peach jam with a reduced amount of sucrose and assess their quality characteristics during storage at ambient temperature.

2. Materials and Methods

For preparation of jams, cultivated raspberry Willamette from Krusevo region and the cultivated peach Cresthaven from Rosoman were used. The manufacture of jams, by using traditional technological methods of processing was performed at the factory Vitalia Nikola Ltd., Skopje. Jams were prepared with a reduced amount of sucrose. To achieve the desired texture during the production process, a low-esterified pectin from the GENU pectin type LM 115AS by CPKelco with the addition of calcium ions in the form of calcium citrate was added. The necessary acidity was provided using citric acid.

The technological procedure comprises the following operations: washing and inspection, boiling by adding a sucrose while stirring continuously, adding pectin, calcium citrate and acid, mixing, filling in jars and closing. The jam samples were cooked in the open inox kettle. The percentage of dry matter during the production process has been controlled by a refractometer. The processed jams were packed into glass jars and stored at ambient temperature.

The produced jams were tested for their physico-chemical composition and microbiological safety after storage of 15 and 90 days.

The physico-chemical composition was estimated by determination of: total dry matter by oven drying at 105 °C, content of total soluble solids by means of a refractometer, a gravimetric determination of ash in a muffle furnace at 550 °C, total acidity by titration of a solution of NaOH with concentration of 0.1 mol/L, the pH value with a pH meter, determination of sugars with

the HPLC-RI method, vitamin C with an iodometric titration method, fats with the Soxhlet method and proteins with the Kjeldahl method.

The microbiological tests have been made in order to confirm the microbiological safety of the jams produced.

3. Results and Discussion

The data on physico-chemical analysis of the produced jams after storage of 15 and 90 days are presented in Figure 1 – 3 and in Table 1.

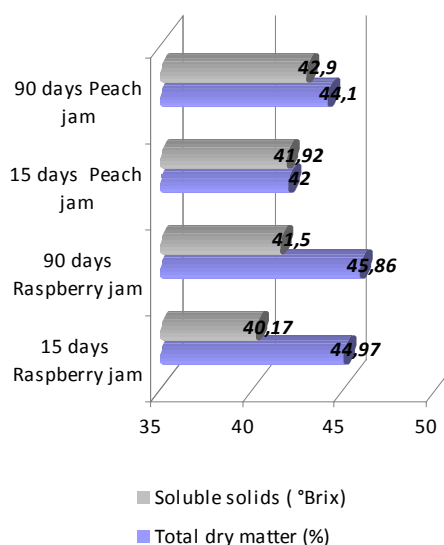


Figure 1. The results obtained for total dry matter (%) and soluble solids (°Brix) in produced jams after storage of 15 and 90 days

Results presented in Figure 1 shown that the total dry matter content of the jams increased during 90 days of storage, which reflected on the values for soluble solids. These results are in agreement with the results of Rehman *et al.* [3] who reported that total soluble solids increased from 66.5 to 68.8 in strawberry jam after 60 days. In another study Ehsan *et al.* [7] reported a slight increase in total soluble solids of grape fruit apple marmalade from 70.0 to 70.8 after 60 days. The increase in total soluble solids contents of the product may be due to the solubilization of jam constituents during storage [8].

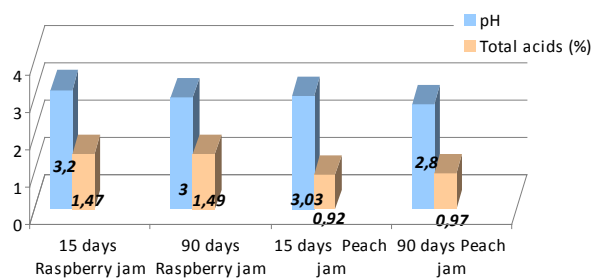
The ash value is a measure of the amount of added minerals. Natural ash content is due to the minerals like calcium, phosphorus and iron. Ash content of a foodstuff represents inorganic residue remaining after destruction of organic matter [5]. Time did not affect the ash content of the produced jams (Table 1). Similar observation was found by Clarissa *et al.* [9] who did not found change in ash content during the storage of a mixed araça and marolo jam.

Table 1. The effect of storage on ash, fats, vitamin C and proteins of produced jams

Sample	Raspberry jam		Peach jam	
	15 days	90 days	15 days	90 days
Ash (%)	0.29	0.29	0.22	0.22
Fats (%)	0.90	0.90	0.97	0.97
Vitamin C (mg/100 g)	19.40	19.40	15.20	15.20
Proteins (%)	1.76	0.48	1.82	0.27

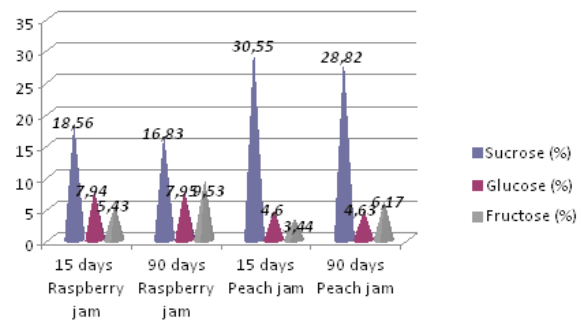
Also, storage time did not affect on the content of the fats and vitamin C. According to Dauthy [10] about 30 % of vitamin C found in the fresh fruit has been lost during the production of jam, but its remains in the finished product were stable during storage. Other authors reported decreasing of vitamin C during the storage of fruit products [4, 5, 8 and 11]. The ascorbic acid content decreased due to oxidation of ascorbic acid to dehydroascorbic acid [5], and the values of proteins decreased also during storage.

The jam samples were analyzed for acidity after 90 days of storage. In raspberry jam and peach jam, total acids increased from 1.47% to 1.49% and from 0.92% to 0.97% respectively. There was a proportional decrease in pH value with the increased acidity during storage (Figure 2). The results are in complete agreement with other researchers [3, 4, 7, 8, 11 and 12]. The increase in acidity and decrease in pH may be ascribed to rise in the concentration of weakly ionized acid and their salts during storage [7 and 12]. This increase in acidity and decrease in pH might also be due to ascorbic acid degradation, hydrolysis of pectin or degradation of polysaccharides and oxidation of reducing sugar [4, 7, and 11].

**Figure 2. The values obtained for total acids and pH in jams after storage of 15 and 90 days**

Sugars are the most important constituents of fruit product and are essential factor for the flavor of the food product and act as a natural food preservative [3]. From the results shown in Figure 3 it is evident that reducing sugar increased and non reducing sugar decreased in jam samples during the storage period. The increase in reducing sugars might be due to inversion

of non-reducing sugars to reducing sugar (glucose + fructose) during storage [2, 3, 8 and 13].

**Figure 3. The content of sucrose, glucose and fructose in jams after storage of 15 and 90 days**

The results are in agreement with Muhammad *et al.* [8] who observed increasing trend in reducing sugars and decreasing trend in non-reducing sugars of diet apple jam during 3 months of storage. Ehsan *et al.* [7] while working on grape fruit apple marmalade observed increase in reducing sugar and decrease in non-reducing sugar.

According to the values of the studied parameters, jams meet the conditions prescribed in the Regulation for special security requirements of fruit jams, jellies, marmalades and sweetened chestnut purée [14].

From the microbiological analysis in varieties of jams, it was estimated that the number of present microorganisms *Listeria monocytogenes*, *Salmonella* spp., *Escherichia coli*, yeast and must, that the number of present microorganisms were within the acceptable limits according to the regulation on microbiological criteria for foodstuffs [15]

4. Conclusions

- This work was aimed to producing low sugars jams from different fruits (raspberry, peach) and assess their quality characteristics during storage at ambient temperature.
- Production of jams shown overall positive results although some changes occurred during storage in the levels of sucrose, protein, pH value, decreased, whereas the levels of total dry matter, soluble solids, reducing sugar and total acids, increased. The fats, vitamin C and ash content were not influenced by the time factor. The microbiological parameters were within the standards established by the Macedonian legislation. Therefore, this jams stored for up to 3 months can still be consumed safely.
- It was concluded that the products are of good quality both raspberry and peach fruit can be utilized and preserved in the form of jam. So that the growers, processors and the consumers can get maximum benefits of their produce.

5. References

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