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Dependence of Vitamin C and Total Soluble Solids (TSS) in Quince Fruit on Sugar and Pectin Content

Odinaev Mirzamad Isaevich
PhD, Tashkent State Agrarian University

Asilova Feruza Mirxosilovna
Assistant teacher, Tashkent State Agrarian University

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ABSTRACT

Apples and quinces are one of the most widely grown fruits in Uzbekistan. These fruits are wasted during ripening due to some reasons. One of the ways to preserve and extend the shelf life of these fruits without wasting is making jam. Jam is a gel-like and semi-solid food. The preparation of apple jam was combined with the addition of quince, which contains pectin, which helps to form gels. Sugar is added as a preservative. On the other hand, sugar plays a role in gel formation with pectin. Industrially obtained pectin was added to improve the gel formation in the preparation of jam. Factors observed in this study are the concentration of sugar (50, 60, 70%) and industrially obtained pectin (0, 0, 3, 0, 5%), which can affect some quality parameters such as spreadability of jam, total soluble solid (TSS), vitamin C value. The best characteristics of jam with spreadability 13.5, TSS value 70.5%, vitamin C value 0.81% were obtained with 50% sugar addition without adding pectin.

Introduction

Apple fruit has a high nutritional content. The main pigment in apples has been identified as betacyanin. At least seven known betacyanins have been identified from this fruit, namely: betanin, isobetanin, phyllocactin, isophyllocactin, betanidin, isobetanidin, and hyloserenin[2]. Apples are usually eaten straight or can be added to fruit cocktails. Apple fruit availability can be very high during the ripening season. This can lead to a very low economic value of the fruit. Apples contain a lot of water, which can cause some rotting. Rotting of apple fruit leads to a decrease in its quality and nutritional value. One way to extend the shelf life of apples is to process them as jam.

Jam is a hard fruit gel made by boiling the flesh of the fruit pulp with other ingredients such as sugar (sucrose), pectin and acid. Other ingredients such as preservatives, colorings or flavorings may be added for special purposes [3]. Jams should be semi-dark and medium in consistency. The jam should contain a minimum fruit content of 40% and the expected total soluble solid content should not be less than 68% [4].

One of the fruits that is known to have a fairly high pectin content is quince. Quince contains many nutrients such as vitamin A, calcium, phosphorus, magnesium, iron, sodium, potassium, dextrose, sucrose, and bromelain, which are 95% mixed cysteine proteases [5] and quince also contains It is known to contain 29% pectin.

In addition to quince, industrially obtained pectin (commercial pectin) can also be added in the

preparation of jam. Usually, commercial pectin is added if the pectin content of the fruit is low for making jam. Pectin is a polymer compound that can bind water, form a gel, or thicken a liquid with sugar and acid. Low methoxyl (LM) pectins are often used in low sugar products due to their gel-forming properties in the presence of no or low sugar and Ca2+[5]. In addition to playing a role in gel formation, pectin can preserve anthocyanin and the color of strawberry jams and spreads [1].

Other ingredients for making jam are sugar. Sugar can serve as a sweetener and preservative. Adding sugar is essential to keep jams satisfying [2]. In addition, sugar contributes to the formation of gels in the preparation of jam. The higher the level of pectin and sugar, the denser the product.

The purpose of this study was to determine the effect of adding pectin and sugar on the characteristics of apple fruit jam combined with quince. Some parameters observed were jam consistency, TSS, Vitamin C value.

Materials and Methods

Materials. Materials used in the preparation of apple fruit jam include: apple fruit, quince, sugar, pectin.

Methods. Apples and quinces were removed from the flesh, cut, and then ground using a blender until the pulp was obtained. The ratio of apple pulp and quince was 3:2. Then pectin and sugar were added to the pulp mixture and heated at 80-900 C until thickening. The resulting jams were previously stored in a sterilized jar.

The characteristics of apple and quince jams were determined by spreading ability, TSS by hand refractometer, and vitamin C by iodometric titration method.

Results and Discussion

Spreadability. Spreadability is an important parameter for jam products. A good jam has semi-solid properties and is soft enough to provide good spreadability. Some factors affecting gel formation are the presence of pectin, acids and sugars. Both acids and sugars synergize with pectin to form gel fibers in jam making. Jams that are too hard do not fare well because they are difficult to spread, on the other hand jams that are too watery do not spread well.

Table 1. Spreadability of apple and quince fruit jams at different concentrations of sugar and pectin (cm).

Sugar %	Pectin %		
	0	0.3	0.5
50	13.50	9.35	8.85
60	14.15	11.75	10.00
70	13.75	13.60	11.05

The highest spreadability was obtained in apple fruit and quince jams with 60% sugar without adding pectin, while the lowest spreadability was obtained at 8.85 in jams with 50% sugar and 0.5% pectin. Table 1 showed that there was no significant difference in the spreadability of apple and quince fruit jams. Neither sugar nor pectin made any difference to the parameter, and there was no interaction between the two factors.

Table 2. Total soluble solid (TSS) value (%) of apple and quince fruit jams at different concentrations of sugar and pectin

Sugar %	Pectin %		
	0	0.3	0.5
50	70.5	69	68
60	69.5	69	69.5
70	66	68	71

Table 2 showed that there was no significant difference in total soluble solid value of sugar and pectin. On the other hand, there was an interaction between the two factors. This means that the presence of sugar and pectin influenced the total melt hardness of apple and quince fruit jams. Soluble pectin has a strong effect on dissolved solids in food. The more pectin added, the higher the total solids content of quince.

The worst result was recorded with 70% sugar and 0% pectin with 66%. The best result was 71% when sugar was 70% and pectin was 0.5%. This suggests that higher sugar and pectin content results in higher total soluble solid (TSS) content. However, overindulgence in sugar can affect some of its other qualities. Therefore, it is better to have a minimum amount of sugar of 50% and an average of 0.3% of pectin.

Vitamin C

Sugar and pectin showed no significant difference in vitamin C. There was no interaction between the two factors. Ascorbic acid is a component that can provide vitamin C in apples.

Low levels of vitamin C are caused by the high-temperature cooking process, which destroys vitamin C. At the same time, the higher the heating temperature, the higher the level of vitamin C, the more it is destroyed by heat.

Table 3. Vitamin C content (%) of apple and quince fruit jams at different concentrations of sugar and pectin

Sugar %	Pectin %		
	0	0.3	0.5
50	0.81	0.66	0.82
60	0.77	0.60	0.78
70	0.89	0.64	0.98

Conclusion

These studies showed that the higher the sugar and pectin content, the higher the total soluble solids, spreadability and vitamin C content of the jam. However, the high sugar content can affect other qualities of the jam. Also, when the sugar content is high, it cannot be recommended for wide consumption. Therefore, the sugar content is at least 50%, and the pectin content is 0.3% on average.

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