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Development of Pear Fruit RTS Beverage

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Abstract - The present study aimed to develop a nutraceutical ready-to-serve (RTS) beverage using pear fruit to enhance its nutritional value and extend its shelf life. Preliminary investigations were conducted based on the standards specified for RTS fruit drinks to create a suitable recipe. The RTS beverage was prepared with four levels of pear juice (35%, 45%, 55%, and 65%), sugar (10%, 15%, and 20%), and 0.2% citric acid. Sensory evaluation was carried out with the help of 30 trained panelists at seven-day intervals to determine the optimal juice concentration for the RTS. The sensory evaluation indicated significant differences between treatments concerning color, taste, consistency, and overall acceptability. The RTS beverage with 45% pear juice content and 15% sugar with 0.2% citric acid was selected as the best combination. A storage study was conducted to assess the effects on total soluble solids (TSS), acidity, and pH of the RTS over 35 days, with investigations at seven-day intervals. The study observed a slight increase in TSS from 17.5% to 18.9% and pH from 2.54 to 3.31, along with a slight decrease in acidity from 0.32% to 0.21%, when stored at room temperature (approximately 38°C to 41°C).

Keywords: Pear fruit, RTS, TSS, Acidity, pH, storage study

I. INTRODUCTION

The nutritional value of fruit places it at the top of our food choices. Consuming fruit daily enhances our vitality, and nutrition scientists recommend eating at least 120 grams of fruit every day for a balanced diet. Fresh pear (Pyrus species) is enjoyed worldwide and is commonly found in processed products such as drinks, candy, preserved fruits, and jam. Pears have been used in traditional folk medicine due to their reported anti-inflammatory, anti-hyperglycemic, and diuretic properties. They are also used to relieve coughs and constipation. Pear fruits are a rich source of nutrients, including fiber, vitamin C, and potassium. They also contain phyto-chemicals, especially antioxidants. Pears have fructose and sorbitol, which have been linked to diarrhea in children. The vitamin C content of pears is about 7 mg, making them a good source of this vitamin. Medium-sized pears are concentrated in fiber (6 gm) and are an excellent source of dietary fiber. Like all fruits, pears provide a significant amount of potassium (180 mg).

Compared to other fruits, pears are particularly rich in fructose and sorbitol. Studies show that pears contain higher levels of these sugars than apples, which are higher in glucose and sucrose. Pears are unique in that they are particularly rich in methylated phenolic acids, with 70% of their phenolic acids being demethylated compared to less than 23% in other fruits analyzed. Pears contain 71% insoluble fiber and 29% soluble fiber (Verma et al. 2018). India, with its diverse climatic conditions, is well-suited for pear cultivation, ranging from cold, dry temperate hilly regions to warm, humid subtropical plains in northern India. In India, pear cultivation is

most extensive in the state of Jammu and Kashmir, followed by Uttarakhand and Himachal Pradesh. Due to its abundant production, pears can also be used to make several beverages.

Beverages are consumed by all groups as social drinks due to their health benefits and medicinal value. In India, these drinks are in demand for most of the year. The inclusion of concentrated fruit juices in soft drinks not only imparts characteristic color and flavor but also provides essential nutrients. With the growing demand for such drinks, there is an opportunity to develop enriched fruit juice beverages, as consumers are becoming more conscious about diet and its link to a healthy lifestyle. Aseptically processed and packaged retail packs of ready-to-serve (RTS) beverages are emerging in the market. Adding fruit juices to sweetened aerated water not only provides nutrients but also diversifies soft drink options. Given the increasing demand for these drinks, there is considerable potential for developing naturally nutrient-rich fruit juice beverages (Chandra et al. 2012). Despite the nutritional importance and health benefits of pear fruit, as previously mentioned, people still neglect to consume it, partly due to its shorter shelf life. In light of this, the present investigation aimed to develop a process for preparing pear fruit RTS beverages and to study their chemical and sensory quality during storage.

II. MATERIALS AND METHODS

The materials used for the preparation of the RTS beverage included ripe pear fruit (Pyrus Communis) of the Patharnak variety, sugar, which was added to impart sweetness, act as a mild preservative by modifying the osmotic pressure and preventing spoilage, and citric acid, which served as a preservative. The preparation process for the RTS beverage is illustrated in Fig. 2.

Fig. 1 Pear fruit

Following treatment combinations were made in the development of pear fruit RTS beverage.

T_1 = 35% juice + 10% sugar + 0.2 % citric acid	T_2 = 35% juice + 15% sugar + 0.2 % citric acid
T_3 = 35% juice + 20% sugar + 0.2 % citric acid	T_4 = 45% juice + 10% sugar + 0.2 % citric acid
T_5 = 45% juice + 15% sugar + 0.2 % citric acid	T_6 = 45% juice + 20% sugar + 0.2 % citric acid
T_7 = 55% juice + 10% sugar + 0.2 % citric acid	T_8 = 55% juice + 15% sugar + 0.2 % citric acid
T_9 = 55% juice + 20% sugar + 0.2 % citric acid	T_{10} = 65% juice + 10% sugar + 0.2 % citric acid
T_{11} = 65% juice + 15% sugar + 0.2 % citric acid	T_{12} = 65% juice + 20% sugar + 0.2 % citric acid

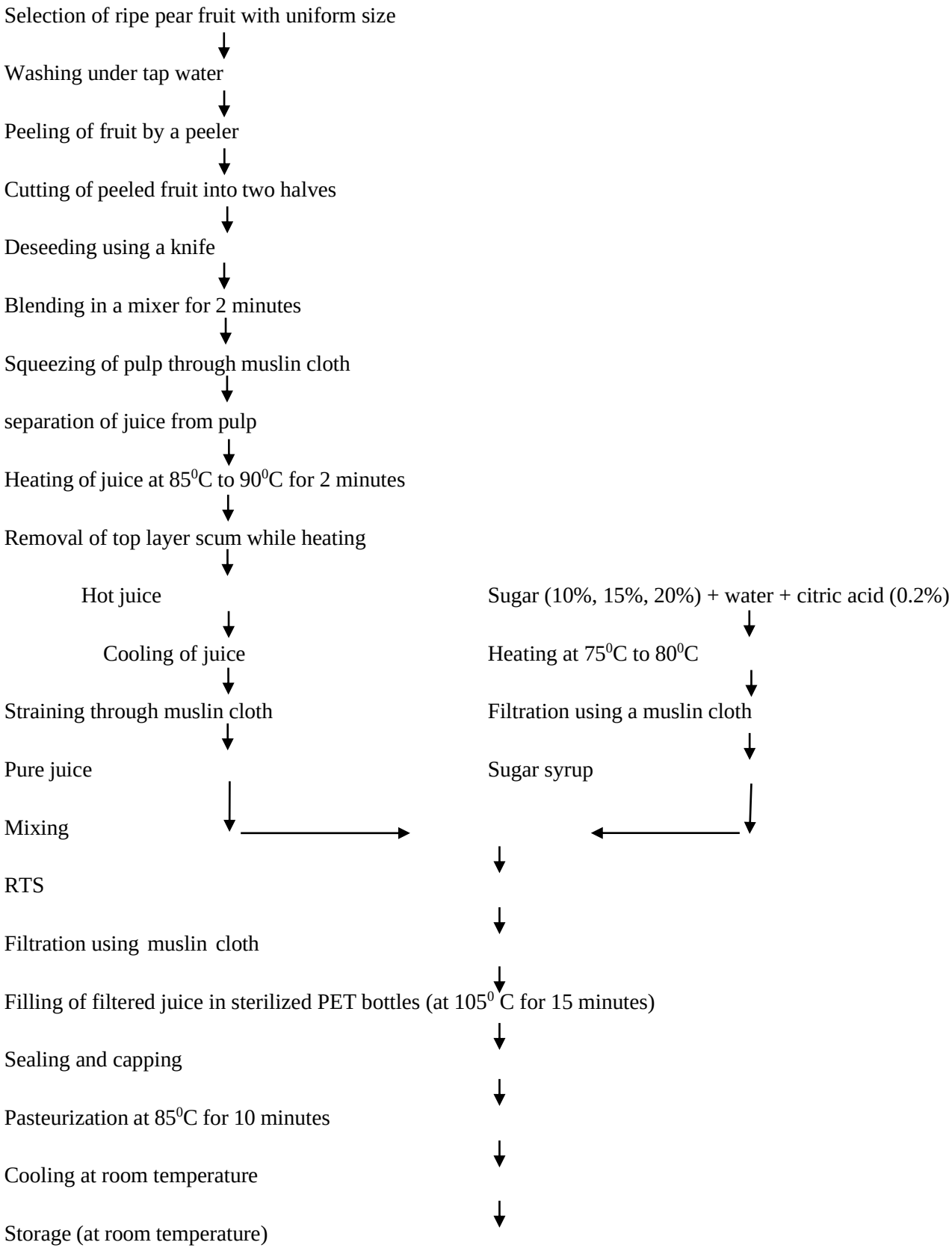

Fig. 2 Flow chart for preparation of RTS beverage

The chemical properties, including TSS (Total Soluble Solids), percent acidity, and pH of the prepared RTS beverage, were calculated according to the AOAC official method. The effect of changing sugar content on the qualitative properties of the RTS during the storage period was analyzed over 35 days, with evaluations every 7 days. This analysis was conducted using the Randomized Blocks Design (RBD) method. Twelve samples of blended RTS were prepared by combining pear juice and sugar syrup in different concentrations and were subjected to sensory evaluation every 7 days over the 35 day storage period. The results were obtained on a 9-point hedonic scale, and the best blending combination was determined accordingly.

Peeling and cutting of pear fruit

Separation of juice from pulp

Heating of juice at 85^0c for 2 minutes

Filling of juice in sterilized PET bottles

Fig. 3 Processing of Pear fruit for preparation of RTS

III. RESULTS AND DISCUSSION

A) Effect of storage period on TSS of pear fruit RTS

According to standards, the TSS of RTS beverages should be more than 10%. The effect of the storage period on the TSS of pear fruit RTS is shown in Fig. 4. It was observed that the TSS of all the samples gradually increased with the storage period. This may be due to the conversion of polysaccharides into simple sugars over time. Additionally, it was noted that as the juice content in the pear fruit RTS increased from 35% to 65%, its TSS significantly increased with both the storage period and sugar percentage. Similarly, it was observed that as the sugar content in the pear fruit RTS increased from 10% to 20%, its TSS significantly increased with the storage period and pear fruit juice content.

B) Effect of storage period on percent acidity of pear fruit RTS

According to standards, the titrable acidity of an RTS sample should be between 0.2% and 0.3%. The effect of the storage period on the acidity of pear fruit RTS is shown in Fig. 5. It was observed that the titrable acidity of all the samples gradually decreased with the storage period. This may be due to the hydrolysis of

polysaccharides over time. Additionally, it was noted that as the juice content in the pear fruit RTS increased from 35% to 65%, its acidity significantly decreased with both the storage period and sugar percentage. Similarly, it was observed that as the sugar content in the pear fruit RTS increased from 10% to 20%, its acidity significantly decreased with the storage period and pear fruit juice content.

C) Effect of storage period on pH of pear fruit RTS

According to standards, the pH of RTS beverages should not be more than 4. The effect of the storage period on the pH of pear fruit RTS is shown in Fig. 6. It was observed that the pH of all the samples gradually increased with the storage period. This might be due to the chemical and enzymatic changes that occur over time. Additionally, it was noted that as the juice content in the pear fruit RTS increased from 35% to 65%, its pH significantly increased with both the storage period and sugar percentage. Similarly, it was observed that as the sugar content in the pear fruit RTS increased from 10% to 20%, its pH significantly increased with the storage period and pear fruit juice content.

D) Organoleptic Evaluation of RTS

Based on the sensory evaluation conducted by the sensory panels for all the treatment samples, it was observed that sample T5, which contains 45% pear fruit juice and 15% sugar, exhibited the best organoleptic quality among all the evaluated samples (Fig. 7).

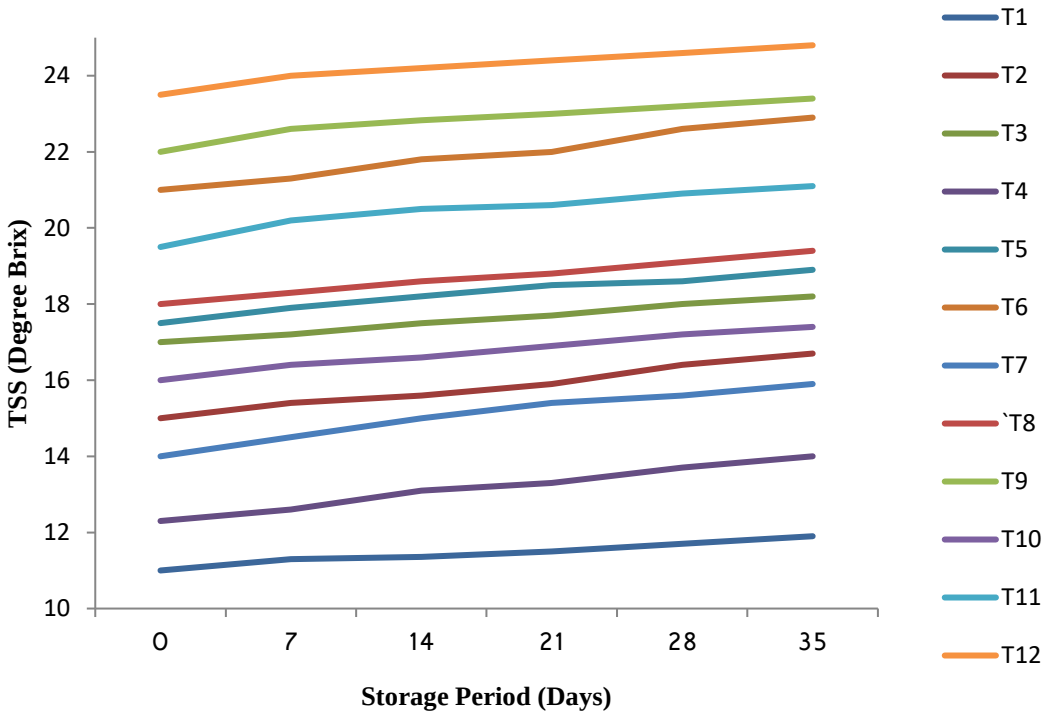

Fig. 4 Effect of storage period on TSS of pear fruit RTS

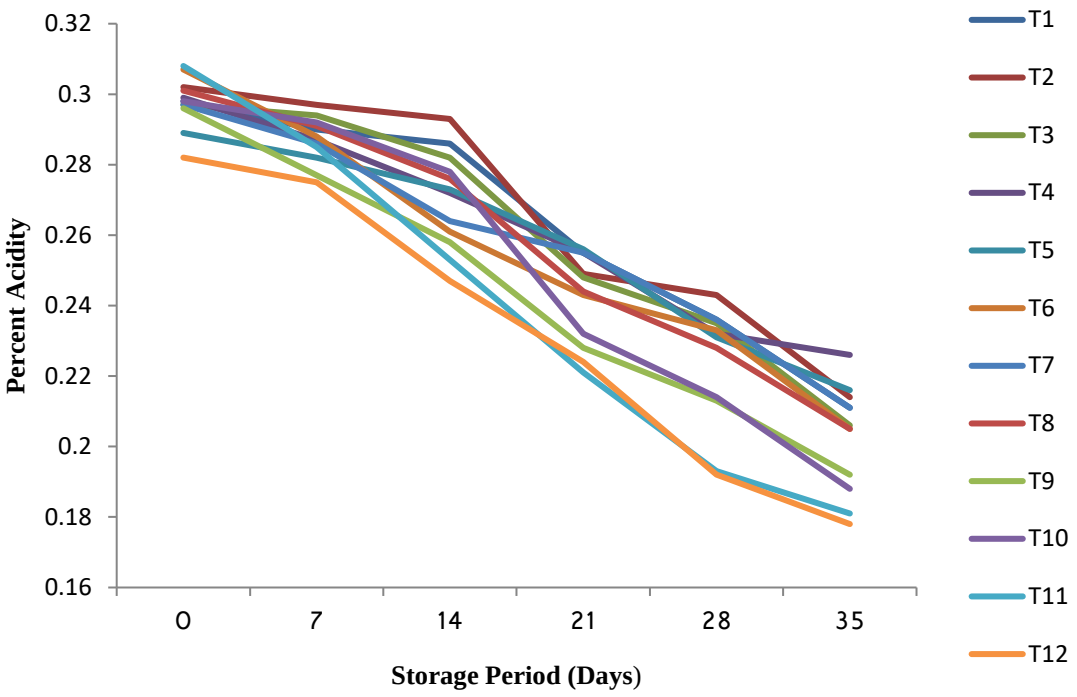

Fig. 5 Effect of storage period on percent acidity of pear fruit RTS

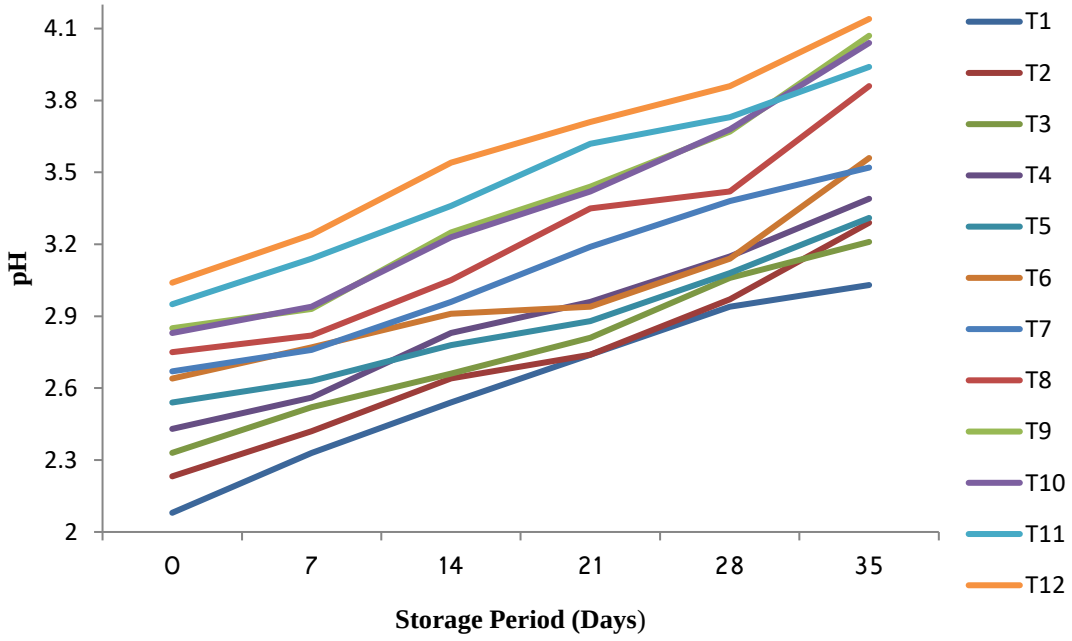

Fig. 6 Effect of storage period on pH of pear fruit RTS

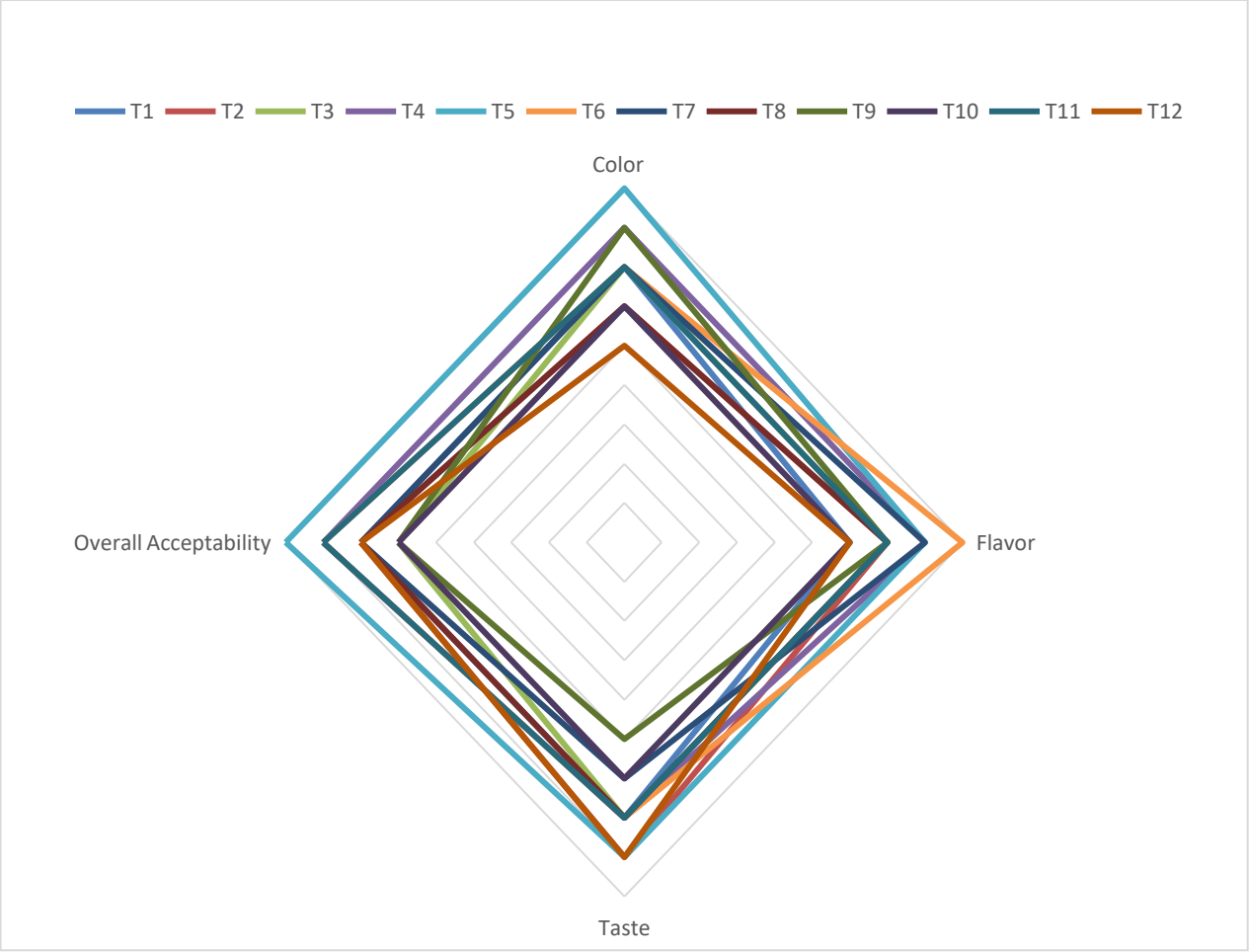

Fig. 7 Overall acceptability for various pear fruit RTS samples

IV. CONCLUSIONS

1) Pear fruit RTS beverage can be prepared using 35%, 45%, 55%, and 65% fruit juice with the addition of 10%, 15%, and 20% sugar.
2) The most preferred pear fruit RTS beverage consists of 45% pear fruit juice and 15% sugar.
3) This beverage can be stored under normal conditions for up to 35 days without any significant changes in its quality attributes.
4) Therefore, developing pear fruit RTS beverages provides fruit processors with a feasible way to offer consumers a high-quality product.

Conflict of interest: The authors declare that they have no conflict of interest.

Ethical statement: The authors declare that they have followed ethical responsibilities.

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