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MICROBIAL EXAMINATION OF REFERIGERATED STORED MANGO SEABUCKTHORN BLENDED PULP WITH SELECTED PRESERVATIVES AND GINGER EXTRACT

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ABSTRACT

The research work was carried out in April 2012. In present research work the effect of chemical preservatives (sodium benzoate, potassium sorbate, potassium metabisulphite) and natural preservative (ginger extract) at refrigerated (4^0C) storage was carried out in mango-seabuckthorn blended pulp and analyzed for microbial aspects. The experiment includes control T_0 mango-seabuckthorn blend (70:30), T_1 mango-seabuckthorn blend (70:30) + sodium benzoate 0.05% + potassium sorbate 0.05%, T_2 mango-seabuckthorn blend (70:30) + potassium sorbate 0.05% + potassium metabisulphite 0.05%, T_3 mango-seabuckthorn blend (70:30) + sodium benzoate 0.05% + potassium metabisulphite 0.05%, T_4 ginger extract 1% with 99% mango-seabuckthorn blend and T_5 ginger extract 2% with 98% mango-seabuckthorn blend. All the samples were analyzed for 7 days after addition of preservatives whereas total plate count, total coliforms and fecal coliforms showed existence in all samples. Yeast and molds were detected in lesser amount while E.coli and salmonella were absent in all mango-seabuckthorn blended pulp during 7 days of refrigerated storage.

Key Words: Microbial load, chemical preservatives, ginger extract, mango- seabuckthorn blended pulp.

INTRODUCTION

The varieties of mango depend on storage conditions. Mango is famous as the king of fruits and has distinctive taste and prominent flavor. Mango is most famous because of its nutritive value strong aroma, delicious taste, strong peel coloration and mango contain high amount of vitamin C, beta-caroteniods and some amount of minerals (Sauco, 2002).

Seabuckthorn is a deciduous flowering shrub or small tree between 2 to 4 meters high, widely distributed throughout the world. The distribution ranges from Himalayan regions including India, Pakistan (Skardu, Swat, Gilgit). *H. rhamnoides ssp. turkestanica* only subspecies originate in Gilgit-Baltistan of Pakistan. It is small orange colored fruit stored house of vitamins and some other bioactive substances. It contains 65-85% juice which is higher in vitamins, amino acids, organic acids. Ascorbic acid amount ranges form 200-1,500 mg/100g this amount is 5-100 times higher than other known vegetable and fruits (Lu 1992). Due to acidic nature fruits of seabuckthorn which is small in size can be consumed fresh and those fruits are very delicate. It is essential for developing new products for scientific utilization in addition with other agricultural fruits.

Chemical preservatives are applied to extend the life of fruit juices and also used to prevent both chemical and biological deterioration of foods. Preservation of mango pulp with chemical preservatives is very fruitful for our economic and climatic conditions. Those chemical preservatives are applied for the prevention of microbial growth which causes spoilage to the food materials and preservatives are widely used as in combination for best outcome. For the prevention of spoilage use of single preservative is not so effective against microbes **(**Hashmi *et al.* 2007). Ginger is a vital constituent of a lot of foodstuff additives with high look upon to antioxidative property established. Ginger extract has no toxic effect while using as preservative in different blends. Comparison of ginger extract with artificial antioxidant is stronger as compared with natural preservative. (Chen *et al.* 1986). Blend is mixing of different juices and pulps of fruit to obtain a mixture of a particular character, quality, or consistency. In beverage industry there is a high demand for nutritional blended juices. Combination of different juices is ordinary practice as they are acidic and powerfully flavored for enjoyable consumption. Blending of seabuckthorn pulp with many other pulps of fruits such as mango papaya and orange with diverse amount of ratios is suitable for better processing of seabuckthorn because by blending with other fruits the astringency of the juice could be minimized (Chauhan *et al*. 2003).

Refrigeration retards the growth of microbes as well as also maintains overall acceptability of food stuffs. It is impossible for transportation of perishable fruits and vegetables through out the world without the applications mechanical refrigeration big cities that are far-away from rising area would finish enjoying plentiful fruits juices and blended pulps (Norman *et al.* 1996).

This research was carried out to study the effect selected chemical preservatives and ginger extract as natural preservative on microbial attributes of mango-seabuckthorn blended pulp during refrigerated storage 4^{o}C.

2.MATERIALS AND METHODS

In this experiment the mango-seabuckthorn blended pulp samples were analyzed at refrigerated storage conditions at 4^{0}C for microbial existence of total plate count, total coliforms, total fecal coliform, E.coli, salmonella, yeast and mould count at PCSIR complex Peshawar. Fresh Mangoes were purchased from Peshawar main market and seeds of seabuckthorn were purchased from Gilgit-Baltistan (Skardu) of Pakistan. Mango-seabuckthorn pulp was extracted by using pulper machine.

1. Preparation of blend and storage

The mango-seabuckthorn blend was prepared by mixing the mango-seabuckthorn blended pulp at 70:30 ratios. The prepared blend was filled in 250 ml plastic jars and stored at refrigerated temperature 4°C.

2. Scheme of study

In this experiment, chemical preservatives such as sodium benzoate, potassium sorbate and potassium metabisuiphite at concentration 0.05 % each were added in combination while two treatments were made by addition of ginger extract 1% and 2% to mango-seabuckthorn blended pulp (70: 30). The samples were analyzed for microbial examination at 4°C. In this experiment six treatments were made which were as follow.

T_0 = Mango-seabuckthorn blend (70:30)

T_1 = Mango-seabuckthorn blend (70:30) + potassium sorbate 0.05 % + sodium benzoate 0.05%.

T_2 = Mango-seabuckthorn blend (70:30) + potassium sorbate 0.05% + potassium metabisulphite 0.05%.

T_3 = Mango-seabuckthorn blend (70:30) + sodium benzoate 0.05% +

potassium metabisulphite 0.05%.

T4 = Ginger extract 1% with 99% mango-seabuckthorn blend.

T5 = Ginger extract 2% with 98% mango-seabuckthorn blend.

3. MICROBIAL EVALUATION

In this experiment the samples were brought to PCSIR laboratories Peshawar. All samples were collected in plastic jars for quantitative and qualitative analysis and refrigerated at 4°C until analysis of samples.

Microbiological analysis of refrigerated mango-sea buckthorn blended pulp.

All Samples treated with control conditions, ginger extract and chemical preservatives microbial growths bacteria, yeast and moulds were recorded control and other samples. Total plate count, total coliform, fecal coliform count, E.coli, Yeast and mold count and salmonella count were analyzed using standard methods by the method Andrew-1992. Manual of food quality control 4.rew.1. Microbiological analysis F.A.O Rome 1992.

Reagents for Microbial Analysis

For analysis serial dilution and plate count method was applied. Various selective media was used, like nutrient agar for Total plate Count (TVC), Eosine methylene blue agar (EMB) for coliform, Thiosulfate citrate bile sucrose agar (TCBS agar) for Salmonella, Yeast Extract-Dextrose Peptone Agar (YEDP Agar) for Yeasts and Sabouraud Agar for Moulds.

RESULTS AND DISCUSSIONS

Microbiological analysis of refrigerated stored mango-seabuckthorn blended Pulp

Table 1: Results for the Microbiological Analysis of the refrigerated stored Mango Seabuckthorn Blended Pulp

	Sample(Test) cfu/g					
Parameter(test)	**T0**	**T1**	**T2**	**T3**	**T4**	**T5**
T.P.C cfu/g	1.8×10^{3}	1.6×10^{3}	1.1×10^{3}	9.76×10^{4}	9.6×10^{4}	6.3×10^{2}
T.C.F mpn/g	>1100	>1100	>1100	46	46	46
F. coliform	+ve	+ve	+ve	+ve	+ve	+ve
E.coli	-ve	-ve	-ve	-ve	-ve	-ve
Salmonella	Absent	Absent	Absent	Absent	Absent	Absent
Yeast & mold cfu/g	2×10^{3}	1×10^{5}	2×10^{4}	1×10^{6}	3×10^{2}	4×10^{3}

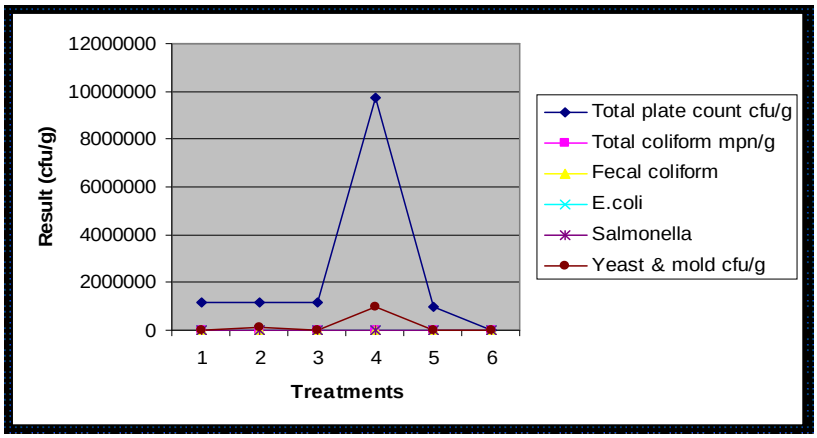

Figure 1: Effect of preservatives and refrigeration on microbial analysis of mango-seabuckthorn blended pulp.

Samples treated with control conditions, ginger extract and chemical preservatives microbial growths bacteria, yeast and moulds were recorded control and other samples. Total plate count, total coliform, fecal coliform count, E.coli, Yeast and mold count and salmonella count were analyzed using standard methods by the method Andrew-1992. Manual of food quality control 4.rew.1. Microbiological analysis F.A.O Rome 1992. The total plate counts (TPC) were high maximum found in T_0 (1.8×10^3) and minimum in T_5 (6.3×10^2) followed by T_4 (9.6×10^4) respectively (Table 8).Total coliform bacteria in mango-seabuckthorn blended pulp samples were high in T_0, T_1, T_2 which were greater than >1100 mpn/g while minimum in T_3, T_4, T_5 which were 46 mpn/g. while fecal coliform count of all mango-seabuckthorn blended pulp samples were positive (Table 1). Samples of mango-seabuckthorn blended pulp were also analyzed for presence of E.coli and salmonella. E.coli and salmonella in all the samples of refrigerated stored mango-seabuckthorn blended pulp were negative. (Table 1).Yeast and mold count were found to be safe due to antimicrobial activity of chemical preservatives and antioxidant activity of ginger extract which were T_0 (2×10^3), T_1 (1×10^5), T_2 (2×10^4), T_3 ($1\times10^{6)}$, T_4 (3×10^2) and T_5 (4×10^3). Samples treated with ginger extracts were minimum (Table 1) might be due to antioxidative activity of aqueous extract of ginger. Similar findings were also observed by Lee *et al.* (1986). Who reported both varieties of meat were safe (< 1 X 10^4) when extracts of ginger was applied to the meat products. The yeast and mold and bacterial plate counts were found to be higher. This could be as a result of unhygienic condition during the process of the product development. Hussain *et al.* (2003) reports that use of potassium metabisulphite reduce the enlargement of microbes in mango pulp. Sakano (1998) concluded that when chemical preservatives were used in mango pulp

results good in retarding the growth of microbes but left some negative impacts on mango pulps sensory and physico-chemical properties.

The data regarding microbial analysis of refrigerated stored mango-seabuckthorn blended pulp is shown in (Table 1). From the above data sample preserved without preservatives rate of microbial load is considerably high while other samples which contain chemical preservatives in combine and ginger extract as natural preservative shows safe range of microbes mango-seabuckthorn blended pulp. Lewis *et al*. (2006) reported that most fruit pulps contains bacterial counts of 1×10^5 cfu/g on their surface Improper washing of fruits adds these bacteria to juices leading to contamination unavailability of running water for dilution and washing, unhygienic surroundings with spilling over flies and airborne dust. (Ayala-Zavala, 2008). Reported that the microbial isolates when treated with ginger and garlic extracts at different concentrations, the growth of these isolates was suppressed. The ginger extract at 1% concentration did not have much effect on both bacterial and fungal isolates but at 5% and 10% concentration the growth was suppressed. Garlic extracts comparatively showed a good antimicrobial activity even at 1% concentration. At 10% concentration the microbial growth was completely inhibited. Foster *et al.* (1995). He studied microbial analysis of mango pulp during storage of 28 days at 13ºC. He observed the growth of yeast and moulds count at 13ºC on mango pulp samples during 28 days of storage. He reported that fruits usually contain micro flora of yeasts and moulds, it is not surprising perhaps the counts in the juices were often very high (> 1.0 x 10^5 cfu mlG1). This may be due to laboratory contamination and poor handling techniques.

CONCLUSION

This study showed that incorporation of ginger extract as natural preservative positively affected microbial load of the mango-seabuckthorn blended pulp. Sample T_2 potassium sorbate 0.05% + potassium metabisulphite 0.05% and T_3 sodium benzoate 0.05% potassium metabisulphite 0.05% obtained maximum score in microbial aspects. While samples (T_4 and T_5) treated with ginger extract as natural preservative were found safe range of microbes. Yeast and mold count were found to be safe due to antimicrobial activity of chemical preservatives and antioxidant activity of ginger extract.

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