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Aruna R

Assistant Professor, Department of Food Safety and Quality Assurance, College of Food Science and Technology, Chinnarangapuram, Pulivendula, Kadapa, Acharya N. G. Ranga Agricultural University, Andhra Pradesh, India

Manjula B

Assistant professor, Department of Food Processing Engineering, College of Agricultural Engineering, Penukonda Road, Madakasira, Anantapur, Acharya N. G. Ranga Agricultural University, Andhra Pradesh, India

Penchalaraju M

Teaching associate, Department of Food Processing Technology, College of Food Science and Technology, Chinnarangapuram, Pulivendula, Kadapa, Acharya N. G. Ranga Agricultural University, Andhra Pradesh, India

Chandrika C

Student, B. Tech. Food Technology, College of Food Science and Technology, Chinnarangapuram, Pulivendula, Kadapa, Acharya N. G. Ranga Agricultural University, Andhra Pradesh, India

Correspondence**Aruna R**

Assistant Professor, Department of Food Safety and Quality Assurance, College of Food Science and Technology, Chinnarangapuram, Pulivendula, Kadapa, Acharya N. G. Ranga Agricultural University, Andhra Pradesh, India

Effect of fenugreek seed mucilage on physico-chemical properties of Mosambi fruit juice

Aruna R, Manjula B, Penchalaraju M and Chandrika C

Abstract

The study was conducted to investigate the effect fenugreek seed mucilage on physico-chemical properties of Mosambi fruit juice. Mucilage was extracted from fenugreek seeds by precipitation and centrifugation methods. Extracted mucilage was added to Mosambi fruit juice (50ml) and three experimental products such as T₁, T₂, T₃ and control samples (T₄) were developed. Mucilage is added at the rate of 50mg, 75mg and 100mg in T₁, T₂, T₃ respectively and control sample is prepared without addition of mucilage. All the experimental products and control samples were subjected for physico-chemical analysis and results showed that Total soluble solids (TSS) was 4 °Brix in control sample and 8 °Brix in all experimental products such as T₁, T₂, T₃ at one hour incubation period. Viscosity was measured for all the samples and results showed that (T₁-1.07 mPa.s, T₂ - 1.05 mPa.s and T₃-1.02 mPa.s, and control-1.14 mPa.s) with increasing concentration of mucilage there was a drop in viscosity of experimental products T₁, T₂ and T₃. Titratable acidity was increased in experimental products (from T₁ was 0.64, T₂ 0.74 and T₃ 0.77) and control was 0.57. pH was decreased in all experimental products T₁ (5.1) and T₂ (5.2) and T₃ (5.3) compare to control (5.4). Mucilage as a clarifying agent can alter the physico-chemical properties like TSS, pH, acidity, viscosity of fruit juices.

Keywords: fenugreek seed, physico chemical properties, Mosambi fruit, juice

Introduction

In India, natural gums and mucilage are well known for their medicinal use. Certain plants contain natural polysaccharides which have employed as food and pharmaceutical applications. Mucilages are physiological products, often found in different parts of plants. They are plant hydro colloids and have a variety of applications in the food industry. They have different uses like water retention and stabilization, stabilizers for ice-cream, meat products and instant pudding, dairy, confectionary and meat products, beverages, backed products, and sauces (Umesh kumar M. Deogade *et al.*, 2012) [5]. *Trigonella Foenum-graceum*, commonly known as Fenugreek, is an herbaceous plant of the leguminous family and is native to Western Asia, from where it has spread widely over Europe, the Mediterranean, and the rest of Asia. It is one of the oldest cultivated plants and has found wide applications as a food, a food additive, and as a traditional medicine in every region where it has been cultivated. The leaves and both the ripe and unripe seeds of *Trigonella Foenum-graceum* are used as vegetables. The seeds also function as a food preservative and are added to pickles, chutneys, and other similar food products. The ripe seeds have numerous applications in cosmetic and traditional medicine system of India. Fenugreek seeds contain a high percentage of mucilage (a natural gummy substance present in the coatings of many seeds). Although it does not dissolve in water, mucilage forms a viscous tacky mass when exposed to fluids. Like other mucilage-containing substances, fenugreek seeds swell up and become slick when they are exposed to fluids. The resulting soft mass is not absorbed by the body, but instead passes through the intestines and triggers intestinal muscle contractions.

Mucilage is a metabolized product which is intracellularly formed without injury to the plant. They form slimy mass in the presence of water.

The mucilage powder isolated from lady's finger (*Abelmoschus esculentus*) stem was effective in the clarification of sugarcane juice in the preparation of jiggery (Chavan JK *et al.*, 2007) [3].

Trigonella Foenum-graceum (Fenugreek) mucilage is derived from the endosperm of the seeds. It consists of galactose and mannose. It gives high viscosity in aqueous solution. The fenugreek gum is used for thickening, stabilizing and emulsifying food agents. Fenugreek mucilage is less exploited in the food industry as compared to other gums such as guar and locust bean (Murlidhar *et al.*, 2012) [4].

Therefore, in this context, a research work was undertaken to study the effect of clarification properties of fenugreek seed mucilage on mosambi fruit juice.

Materials and Methods

Materials and chemicals

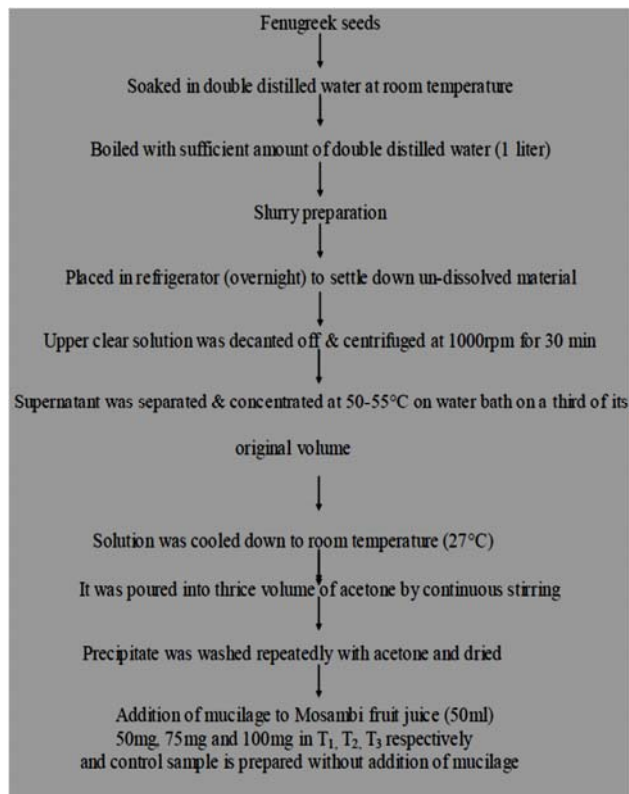
For the present investigation, fenugreek seeds and mosambi fruits were procured from local vegetable market Pulivendula. All other chemicals were purchased from Qualigens Fine Chemicals (Mumbai, India) or Molychem India Pvt. Ltd. (Mumbai, India). Unless otherwise mentioned all chemicals used were of analytical grade.

Physico-chemical characteristics

Viscosity, Total solids and pH of developed samples were determined as per the AOAC methods (AOAC, 2002). Acidity was calculated by titrating against 0.1 N NaOH and expressed as percentage of lactic acid.

Experimental design

Fenugreek seeds were soaked in double distilled water at room temperature and then boiled with sufficient amount of double distilled water under stirring condition in a water bath until slurry was prepared. Then the slurry was cooled and kept in refrigerator overnight to settle out un-dissolved materials. Then upper clear solution was decanted off and centrifuged at 1000 rpm for 30 minutes, the supernatant was separated and concentrated at 50-55 °C on a water bath to a third of its volume. Solution was poured into thrice volume of acetone by continuous stirring. The precipitate was washed repeatedly with acetone and dried in an oven at the temperature < 50 °C and the dried powder was stored in a desiccator until required. Extracted mucilage was added to Mosambi fruit juice (50ml) and three experimental products such as T₁, T₂, and control samples (T₄) were developed. Mucilage is added at the rate of 50mg, 75mg and 100mg in T₁, T₂, T₃ respectively and control sample is prepared without addition of mucilage.



Results and Discussion

Effect of fenugreek mucilage concentrations on TSS with time

TSS of juice fruit juices treated with mucilage and Mucilage levels significantly increases the soluble solid content from 4 °Brix to 8 °Brix. Increasing the incubation time to 1 and 2 h cause significant increase in the TSS content. Different concentrations of Fenugreek mucilage varying from 50, 75, 100mg was added to mosambi whole juice to study the effect on TSS. It is found that highest TSS 8 °Brix was reached at 50mg at 2hrs of incubation. The same 8 °Brix was observed with 75mg of mucilage after 1hr incubation. Further increase in mucilage concentration 100mg of mucilage the same TSS 8 °Brix was observed at 1hr incubation period. After 2 hrs the result was same as at 1hr incubation period.

In whole mosambi fruit juice the significant increase in TSS was observed at 75mg of mucilage concentration at 1hr incubation time. Use of mucilage significantly increases the soluble solid content from 7.5 to 8 °Brix. Clarification using fenugreek seed increased TSS of mosambi juice. The increase in TSS is related to greater degree of tissue breakdown, releasing more compounds such as sugars, which contribute to soluble solids. TSS, ° Brix was increased gradually with a decrease in pH and absorbance was observes with the increasing enzyme concentrations and incubation time (Ahmed B *et al.*, 2014) [1].

Effect of fenugreek mucilage concentrations on Viscosity with time

The viscosity of whole mosambi fruit juice at 0 hrs is 1.22 m.Pa.s. Decrease in viscosity to 1.07, 1.05 and 1.02 m. Pa.s was observed with addition of 50, 75, 100mg of fenugreek mucilage respectively for 1 hr of incubation time for the control it was 1.14 m.Pa.s. Further drop in viscosity to 1.05, 1.03, 1.02, 0.92 m.Pa.s was observed with the 0mg, 50mg, 75mg, and 100mg of mucilage addition respectively after 2 hrs of incubation time. With increasing concentration of mucilage and incubation time there was a drop in viscosity. The viscosity of the mosambi fruit juice after mucilage treatment had decreased. By the result is found that treating the mosambi fruit juice with fenugreek seed mucilage decreases the viscosity was significant compared to the untreated fruit juices.

Effect of fenugreek mucilage concentrations on pH with time

It was found from the Fig.1 that the untreated Mosambi fruit whole juice of pH was decreased with incubation time, from 5.4 at 0 hrs of incubation to 5.3 and 5.2 after 1hr and 2 hrs of incubation respectively. In Mosambi fruit whole juice treated with 50mg, 75mg concentration of fenugreek seed mucilage pH decreased to 5.3, 5.3 respectively after 1hr of incubation and further drop in pH to 5.2, 5.2 respectively after 2hrs of incubation. For 50mg, 75mg of mucilage used, decrease in pH was not significant when compared with the control. Mosambi fruit whole juice treated with 100mg of Fenugreek mucilage there is a significant decrease in the pH from 5.4 at 0hrs of incubation to 5.1 and 5.0 after 1hr and 2hrs of incubation time. Mosambi fruit whole juice treated with 100mg of Fenugreek mucilage, the decreased pH values of the fruit juice was significantly different from the initial values resulting in increasing of shelf life of fruit juice.

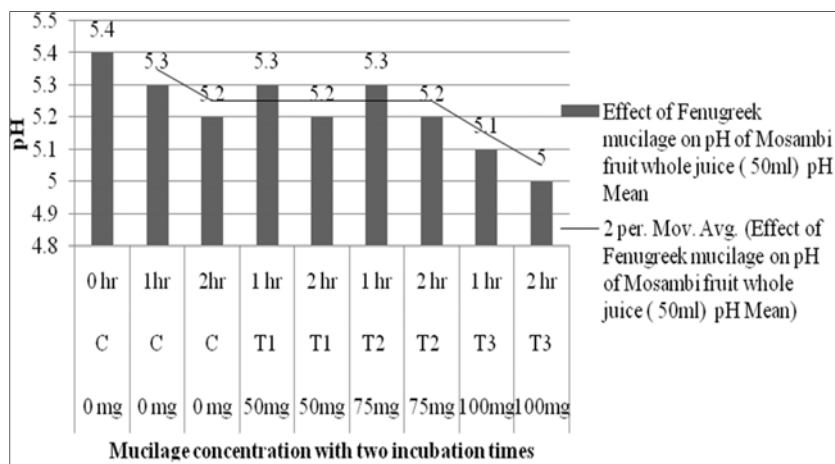


Fig 1: Effect of fenugreek mucilage concentrations on pH with time

Effect of fenugreek mucilage concentrations on Titratable acidity with time

Titratable acidity of untreated fresh mosambi whole juice was 0.57 and increased to 0.64 and 0.73 by 1hr and 2hrs of incubation. Whole mosambi fruit juice treated with 50mg, 75mg of mucilage found a rise in the titratable acidity by

0.77, 0.83 by 1hr incubation and 0.83, 0.9 by 2 hrs incubation respectively. Treatment with 100mg cause decreased titratable acidity to 0.74, 0.77 by 1hr and 2hrs of incubation. Highest increase in titratable acidity 0.83 and 0.9 was observed with 1hr and 2 hrs incubation time respectively in the samples treated with 75mg mucilage (Fig. 2).

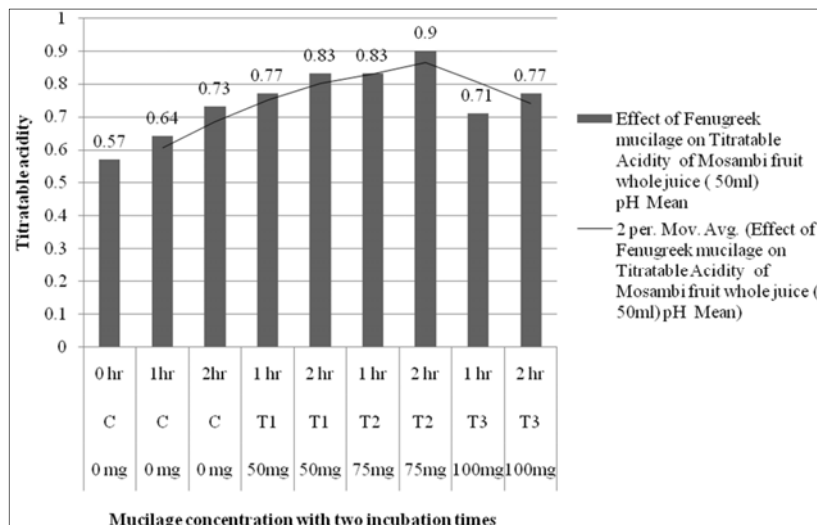


Fig 2: Effect of fenugreek mucilage concentrations on Titratable Acidity with time

Conclusion

The results obtained from analytical work, established that the treated fruit juice with fenugreek mucilage was as effective as enzymatic treatment for clarification of mosambi fruit juice. Further using mucilage substances are cost effective. To enhance filtration process performance, pretreating with mucilage of fenugreek seeds before filtration, for the purpose of flocculating soluble polysaccharides responsible for high viscosity can be an effective pretreatment as pre-treatment with enzymes. Increasing the incubation time to 2hrs did not cause any significant increase in the TSS content for all the test samples. The viscosity of the juice after mucilage treatment of mosambi fruit juice had decreased. Incubation time also affected the viscosity. Mosambi fruit juice treated with mucilage, there was raise in TA (titratable acidity) compared with untreated mosambi fruit juice. The mosambi fruit juices treated with different concentration of mucilage also, pH decreased with increasing incubation time. Viscosity, titratable acidity, TSS, pH changes observed in mucilage

treated mosambi juice were similar to that of juices treated enzymatically. The present study may be extended to other beverages using other mucilages.

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