



Effects of Microwave Heating and Conventional Pasteurization on Ascorbic Acid (Vitamin C), Tannin content, Total phenolic content of Amla (*Phyllanthus emblica*) Juice

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ABSTRACT

Effects of microwave heating and conventional pasteurization on Ascorbic Acid (Vitamin C), Tannin content and Total Phenolic Content of Amla (*Phyllanthus emblica*) juice was analyzed. During study we find that Ascorbic Acid (Vitamin C) reduces to 810 ± 1.52 (mg/100gm) and 817 ± 2.51 (mg/100gm) from 821.66 ± 2.08 , Tannin content reduces to 1.32 ± 0.026 and 1.01 ± 0.035 (mg/ml) from 1.78 ± 0.02 (mg/ml), whereas Total Phenolic Content reduces to 667.5 ± 3.31 (mg GAE/L) and $879.36 \pm 1.05b$ (mg GAE/L) from 1138 ± 2.0 (mg GAE/L). Study reveals that ascorbic acid (Vitamin C) is less affected by microwave heating pasteurization while tannin degradation is high in case of microwave heating pasteurization compare to conventional pasteurization. The reduction in total phenolic content is high due to conventional pasteurization compare to microwave heating pasteurization.

INTRODUCTION

In juice manufacturing industries thermal treatments are commonly applied for preservation of juices. Microwave heating generate volumetric heating within the food material and produce high quality self-stable food products. Rather than the traditional heating methods microwave heating inactivate the enzymes and microorganisms very fast and organoleptic quality characteristics of food can be protected (Math et al., 2014) and minimize the quality losses (Ahsen and Taner 2011).

Juices are consumed worldwide as they are good source of vitamins, minerals and fibers (Righetto et al 1999). Citrus juices are complex mixtures of aromatic volatiles and non-volatile components. Aromatic volatiles include esters, aldehydes, ketones and alcohols while non-volatile components include organic acids and sugars (Barboni et al., 2009). Citrus juice contain most important antioxidant i.e. ascorbic acid, flavonoids and phenolic compounds which protects the organism from oxidative stress (Zvaigzne et al., 2009) and are important to human nutrition (Jayaprakasha 2007).

Amla (*Phyllanthus emblica*) fruit have sour and astringent taste, generally utilized as raw and preferred by the consumer because of the rich source of vitamin C and antioxidants. Nutritional and medicinal properties make it popular all over the world (Goyal et al., 2007). It is widely used for the treatment of gastric disorders, dysentery, diarrhea, constipation and jaundice (Parrotta, 2001; Goyal et al., 2007).

There is dearth of literature availability on effects of microwave heating and conventional pasteurization on ascorbic acid (Vitamin C), tannin content and total phenolic content of amla (*Phyllanthus emblica*) juice. The present investigation was therefore planned to analyze the effects of microwave heating and conventional pasteurization on ascorbic acid (Vitamin C), tannin content and total phenolic content of amla juice.

MATERIALS AND METHODS

Raw materials

Amla (*Phyllanthus emblica*) of sound and good quality were procured from the local market of Dehradun, Uttarakhand. Juice was prepared by squeezing and stored in a refrigerator at $4 \pm 1^\circ\text{C}$ for further analysis.

Treatments

Conventional pasteurization

Freshly prepared juice was filtered and poured into sterilized bottles and then heated at $85-90^\circ\text{C}$ by using thermostatic water bath and maintain the temperature of juice $85-90^\circ\text{C}$ for 15 seconds. Pasteurized juice was cooled to room temperature and stored in a refrigerator for further analysis.

Microwave heating pasteurization

Microwave heating pasteurization was done by using microwave oven in which juice was heated for 60 s and maintained the temperature $85-90^\circ\text{C}$. Treated juice was cooled to room temperature and stored in a refrigerator for further analysis.

Determination of Ascorbic acid (Vitamin C), Tannin content and Total Phenolic content

Ascorbic acid (Vitamin C) was measured by standard method of (Sawhney and Singh 2015). Tannin content was determined by the protein precipitation method of (Hagerman and Butler 1978) and total phenolic content was measured by the method of (Makkar et al., 1993).

Statistical analysis

One-way analysis of variance (ANOVA) was used to find the significant differences among the means followed by Tukey's HSD test ($p < 0.05$) using SPSS. The experiments were performed in triplets. Results were expressed as mean \pm SD.

RESULTS AND DISCUSSION

Effect of treatments on Ascorbic Acid (Vitamin C)

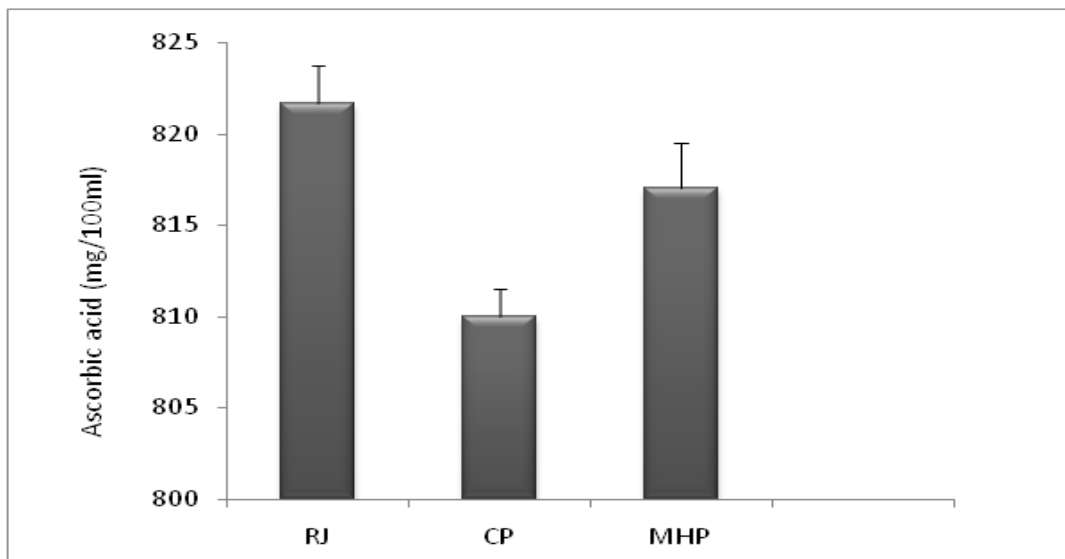
The ascorbic acid (vitamin C) of fresh amla juice was observed 821.66 mg/100ml and after conventional and microwave heating pasteurization it was 810 mg/100ml and 817 mg/100ml respectively as shown in table 1. The decrease in ascorbic acid (vitamin C) may be due to degradation of vitamin C because its heat labile nature. Our finding favors the findings of (Cinquanta et al. 2010 ; Kumar et al., 2017) who also reported the decrease in ascorbic acid (vitamin C) during microwave pasteurization of orange juice and decrease in ascorbic acid (vitamin C) in case of pomelo juice respectively. Figure 1 shows the effect of conventional and microwave heating pasteurization on ascorbic acid (Vitamin C) of amla juice.

Effect of treatment on Tannin Content

Table 1 show that the tannin content of fresh amla juice was 1.78 mg/ml and after conventional and microwave heating pasteurization it was 1.32 mg/ml and 1.01 mg/ml respectively. Figure 2 shows the effect of conventional and microwave heating pasteurization on tannin content. Our finding favors the findings of (Hassan 2011) who also reported that tannin content is reduced on microwave heating in case of Peanut and Sesame Seeds.

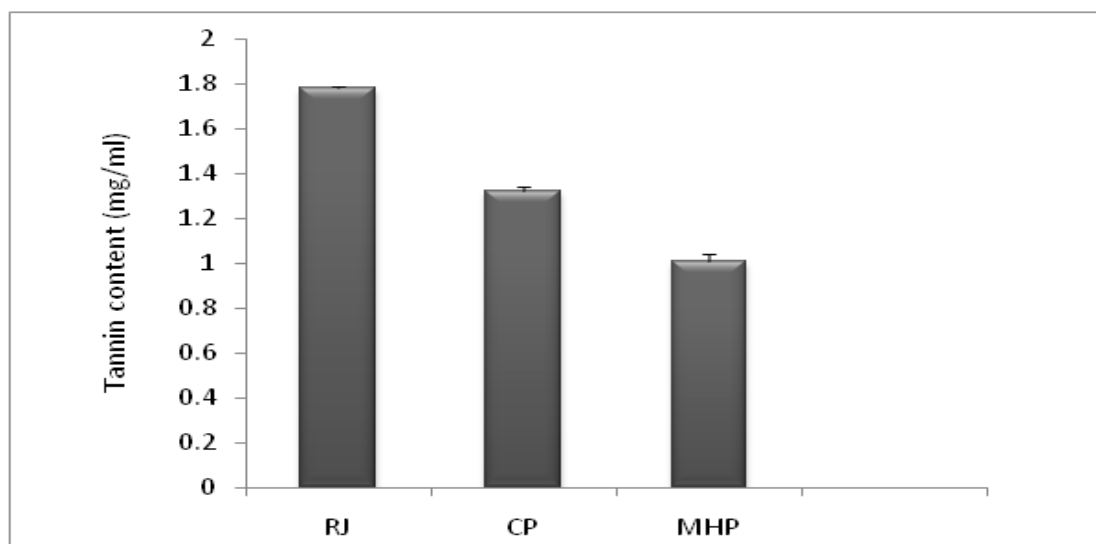
Effect of treatments on Total Phenolic Contents

Table 1 show that the total phenolic content of fresh amla juice was observed 1138 mg GAE/L and after conventional and microwave heating pasteurization treatment it was 667.5 mg GAE/L and 879.36 mg GAE/L respectively.



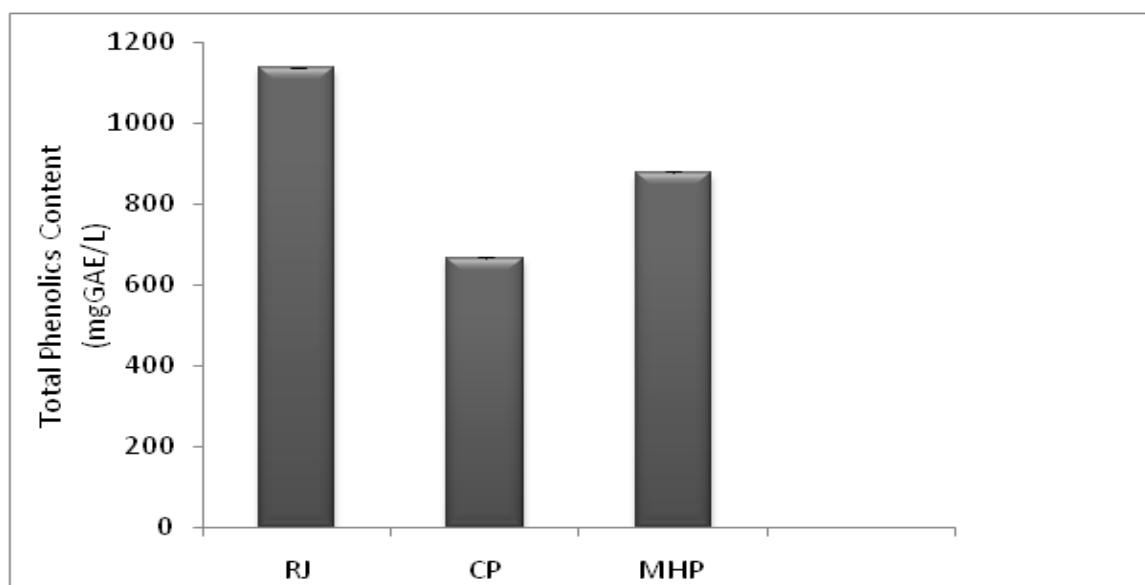
RJ= Raw Juice, CP= conventional pasteurization and MHP= microwave heating and conventional pasteurization

Table 1: Effect of microwave heating and conventional pasteurization on ascorbic acid of amla Juice .



RJ= Raw Juice, CP= conventional pasteurization and MHP= microwave heating and conventional pasteurization

Table 2: Effect of microwave heating and conventional pasteurization on tannin content of amla Juice



RJ= Raw Juice, CP= conventional pasteurization and MHP= microwave heating and conventional pasteurization

Table 3: Effect of microwave heating and conventional pasteurization on total phenolic content of amla Juice.

Table 3: Effect of treatments on ascorbic Acid (Vitamin C), tannin content and total phenolic content of amla (*Phyllanthusemblica*) Juice.

	Ascorbic Acid (Vitamin C) (mg/100ml)	Tannin Content (mg/ml)	Total Phenolic Content (mgGAE/L)
Raw Juice	821.66±2.08 ^a	1.78±0.01 ^a	1138±2.0 ^a
Conventional Pasteurization	810±1.52 ^c	1.32±.026 ^b	667.5±3.31 ^c
Microwave heating Pasteurization	817±2.51 ^b	1.01±0.035 ^c	879.36±1.05 ^b

Fig.3 shows the effect of conventional and microwave heating pasteurization on total phenolic contents. Our finding favors the findings of (Pala and Toklucu 2011; Mohamed et al. 2014; Kumar et al. 2017) who also reported the decrease in total phenolic contents in thermally and UV treated pomegranate juice and physical is juice respectively.

CONCLUSION

Present investigation has been conducted to analyze the effect of microwave heating and conventional pasteurization on Ascorbic Acid (Vitamin C), Tannin content and Total Phenolic Content of Amla (*Phyllanthus emblica*) juice was analyzed. During study we find that Ascorbic Acid (Vitamin C) reduces to 810±1.52(mg/100gm) and 817±2.51 (mg/100gm) from 821.66±2.08, Tannin content reduces to 1.32±.026 and 1.01±0.035 (mg/ml) from 1.78±0.02 (mg/ml), whereas Total Phenolic Content reduces to 667.5±3.31 (mg GAE/L) and 879.36±1.05b (mg GAE/L) from 1138±2.0 (mg GAE/L). Study reveals that ascorbic acid (Vitamin C) is less affected by microwave heating pasteurization while tannin degradation is high in case of micro wave heating pasteurization compare to conventional pasteurization. The reduction in total phenolic content is high due to conventional pasteurization compare to microwave heating pasteurization.

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