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Processing Effect On Phytochemical Content Of Elaeagnus Latifolia And Hippophae Salicifolia Of Sikkim Himalayas

N. D. Sherpa (Ph.D Scholar)[1],K. D. Bhutia (Assistant Professor)[2]
PhD scholar[1],Faculty[2]
Department of Horticulture, Sikkim University, Gangtok, Sikkim
Email.id: ndomasherpa@gmail, kdbhutia01@cus.ac.in

Abstract

The purpose of the research study was to evaluate the effect of processing on the phytochemical content of two wild fruits of Sikkim Himalayas viz., 'Elaeagnus latifolia and Hippophae salicifolia'. The samples of both the fresh and processed products were estimated. Processed products prepared were Elaeagnus latifolia chutney, ketchup and Hippophae salicifolia juice and jelly. It was observed that the thermal processing of fruits led to statistical significant alterations for phytochemical parameters like total antioxidant, ascorbic acid, total phenol, total flavonoids, total anthocyanin and total carotenoids. The practical implications of this work are that the derived knowledge could be very useful to optimize processing technology which will improve the product quality, consumer acceptability, and marketability in future, further as the consumption of the polyphenolics contained in these wild fruit products will provide benefits for human health as these compounds have probability to reduce the diseases like cancer and cardiovascular diseases.
Keywords: *phytochemical, total phenols, ascorbic acid, total anthocyanin*

Introduction

Wild fruit plants being rich in nutritional and medicinal properties can be alternate and an unconventional source of food for the local community. The majority of these species are considered as poor man's food (Sharma *et al.,* 2016). Wild fruits are vital source of daily diet as they provide food supplements, appetizer also are found to have higher than other known cultivated fruit bearing species (Orech *et al.,* 2007). *Elaeagnus latifolia* and *Hippophae salicifolia* are found abundance in the local market in different season which has resulted in limited scope for expansion of other minor fruits. . However, these wild fruits in the local market are not preferred much in fresh form due to their taste and acidic nature. However, there is a huge opportunity to utilize these wild fruit processed product in the form of frozen (IQF), canned, pulp, puree, paste, sauces, dehydration, pickles, juices, slices, chips, jams, jelly, etc as it is rich in Polyphenols, carotenoids (pro-vitamin A),antioxidants which plays a vital role in the reducing many diseases. Hence, there is a need to concentrate on research efforts in processing and commercialization of such wild fruit crops. There is a rare study on Phytochemical composition of these wild fruit products. Therefore this study focuses on the phytochemical composition of the fresh fruits as well as their processed products and the impact of processing.

Materials and Methods

Underutilized fruits were collected from Sikkim Himalaya. Value added products were prepared by following standard methods. Four value added product of these wild fruits were taken as treatment and replicated three times. Ascorbic acid was done by the method suggested by (AOAC 1980). Total Carotenoids were estimated by the methods describe in (Lichtenthaler and Wellburn, 1987).Total Anthocyanin estimated by using the pH differential method at pH 1.0 and 4.5. (Rodriguez-Saona and Wrolstad, 2001).

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Total Antioxidant

It was determined by using 1, 1-diphenyl-2-picrylhydrazyl (DPPH) following to the method described by (Braca *et al*. 2002) with slight modifications. Equal volumes of methanolic solutions of DPPH (100µM) and crude extract containing (20-200µg/mL) were mixed together. The reaction mixture was shaken well and allowed to stand at room temperature for 30 minutes. The absorbance of the colored complex was measured at 516nm on double beam UV- spectrophotometer against methanol as blank. The L ascorbic acid (100µg/ml) was used as standard and the percent scavenging effect was calculated.

Total flavonoids

The total flavonoids was estimated using spectrophotometric method (Quettier *et al*., 2000) where the sample contained 1 ml of methanol solution of the extract in the concentration of 1 mg/ml and 1 ml of 2% AlCl3 dissolved in methanol solution. The extracts were kept at a room temperature for an hour and the absorbance at λmax = 415 nm through spectrophotometer and was expressed in terms of rutin equivalent (mg of RU/g of extract).

Total phenol

The concentration of total phenol was examined using spectrophotometric method (SINGLETON *et al*., 1999). Methanolic solution of the extract in the concentration of 1 mg/ml was prepared. The samples were store in a thermostat at 45° C for 45 min. The absorbance reading at λmax = 765 nm was taken . It was expressed in terms of gallic acid equivalent (mg of GA/g of extract).

Statistical analysis

All the values of the assay were evaluated by calculating the average in triplicates and data were expressed as mean ± standard deviation.

Results and Discussion

The phytochemical constituents results are presented in table 1. Analysed value added products showed a very good source of polyphenolic compounds. It indicate that the fruit of *Hippophae salicifolia* were a good source of Total Antioxidant 92.69±0.27 µg/ml followed by Total phenol 71.15±0.49 mg g/GAE, Total Flavonoids 39.11±0.57 mg/g/QE Ascorbic acid37.44±0.52 mg/100g, Total Carotenoids 4.45±0.36 mg/100g and Anthocyanin were also detected in small quantity i.e. 0.34±0.03 mg/100g**.** Pant *et al.,* 2014

studied a comparative estimation of Vitamin C and polyphenols content in the berries of three sea buckthorn species (*H.rhamnoides*, *H. salicifolia* and *H. tibetana)* from India and reported that Vit C and phenolic content was found high in *H. salicifolia* with 2984.0 ± 18.5 mg/100g and 521.3 ± 3.2 mg/100g. *Elaeagnus latifolia* fruit were also evaluated where Total phenol 27.90±0.51 mg g/GAE followed by Total Flavonoids 22.72±0.28 mg/g/QE, Total Antioxidant 15.92±0.82 µg/ml, Ascorbic acid 9.93±0.83 mg/100g, 3.27±0.06 Total Carotenoids 3.27±0.06mg/100g and Total Anthocyanin 1.26±0.16mg/100g were obtained repectively. Panja *et al.,* 2014 revealed Total phenolics 7.04 ± 0.27(mg gallic acid Eq), Total flavonoids 5.44 ± 0.16(mg quercetin Eq) in *Elaeagnus latifolia Linn.* which was lesser than our findings. Pandey *et al.,* 2018 reported the ascorbic acid in *Elaeagnus latifolia* 14.13 ± 1.50mg/100g which was partially higher than our research. The content of chemical profile differences estimated is may be from growing conditions, genetic differences, nature of soil composition, the natural environmental, storage, maturity at harvesting time which affects the quality of the produce.

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Table 1 Phytochmical content of *Elaeagnus latifolia* and *Hippophae salicifolia.*

Sl.No.	Phytochemicals	*Elaeagnus latifolia*	*Hippophae salicifolia*
1.	Total antioxidant (µg/ml)	15.92±0.82	92.69±0.27
2.	Ascorbic acid (mg/100g)	9.93±0.83	37.44±0.52
3.	Total phenol (mg/ g/GAE)	27.90±0.51	71.15±0.49
4.	Total flavonoids (mg/g/QE)	22.72±0.28	39.11±0.57
5.	Total carotenoids (mg/100g)	3.27±0.06	4.45±0.36
6.	Total anthocyanin (mg/100g)	1.26±0.16	0.34±0.03

Figure 1: *Elaeagnus latifolia* and its processed products

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Figure 2: *Hippophae salicifolia* and its processed products

Table 2: Phytochemical content processed products of *Elaeagnus latifolia* and *Hippophae salicifolia*

Sl.No.	Phytochemicals	*Elaeagnus latifolia* chutney	*Elaeagnus latifolia* ketchup	*Hippophae salicifolia* juice	*Hippophae salicifolia* jelly
1.	Total Antioxidant µg/ml	8.61±0.07	10.16±0.02	82.01±0.45	73.63±0.02
2.	Ascorbic acid mg/100g	5.88±0.67	7.54±0.43	30.53±0.86	28.04±0.89
3.	Total phenol mg /g/GAE	19.07±0.34	21.55±0.57	69.26±0.06	51.92±0.05
4.	Total Flavonoids mg/g/QE	15.73±0.01	16.42±0.02	32.67±0.01	29.62±0.01
5.	Total Carotenoids mg/100g	2.84±0.06	2.96±0.005	3.16±0.01	2.00±0.09
6.	Total Anthocyanin mg/100g	0.31±0.01	0.36±0.005	0.25±0.01	0.07±0.005

The assessment of phytochemical composition of the processed wild fruit products are presented in table.no.2. The result revealed the content of total antioxidant in the product of *Hippophae salicifolia* juice were 82.01±0.45 µg/ml and in *Hippophae salicifolia* jelly 73.63±0.02 µg/ml whereas in *Elaeagnus latifolia* chutney and *Elaeagnus latifolia* ketchup it was 8.61±0.07 µg/ml and 10.16±0.02

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µg/ml. The content of total phenol in *Hippophae salicifolia* juice and *Hippophae salicifolia* jelly were 69.26±0.06 mg g/GAE and 51.92±0.05 mg g/GAE although in *Elaeagnus latifolia* chutney and *Elaeagnus latifolia* ketchup it was 19.07±0.34 mg g/GAE and 21.55±0.57 mg g/GAE respectively. The presence of Ascorbic acid in *Hippophae salicifolia* juice and *Hippophae salicifolia* jelly was found 30.53±0.86 mg/100g and 28.04±0.89 mg/100g followed by 5.88±0.67 mg/100g in *Elaeagnus latifolia* chutney and 7.54±0.43 mg/100g in *Elaeagnus latifolia* ketchup. Beveridge *et al.*, 2002 reported another species of Seabuckthorn i.e. *Hippophae rhamnoides L.* juice contain 174.2 mg/100 ml of ascorbic acid which is higher than my finding. Total flavonoids were also found with 32.67±0.01 mg/g/QE *Hippophae salicifolia* juice and *Hippophae salicifolia* jelly 29.62±0.01 mg/g/QE followed by 15.73±0.01 *Elaeagnus latifolia* chutney and 16.42±0.02 *Elaeagnus latifolia* ketchup while the composition of total carotenoids and total anthocyanin was fairly present in the processed products. Comparing the phytochemical composition of raw fruits and its processed products, there is a minimum loss of phytochemical after processing, due to thermal treatment. Polyphenolic, anthocyanins are those compound which do not completely remain stable in processing procedure (Talcott *et al.*, 2003). During processing of foods, various transformations of phenolics occur to produce yellowish or brownish (Clifford, 2000).

Conclusion

Current finding of the study suggest that these wild fruits and its processed products are rich in phytochemical although there was a minimum loss after processing but still these wild fruits processed products have show a great potential in ensuring food and nutritional security at times of food scarcity, to make seasonal horticultural produce available throughout the year, to put them in convenient form for the user, to safely put the food away for emergencies to increase the value of the product and also better return to the farmers. It could be a alternate source for supplements to the diet of the population. The derived knowledge could be very useful to optimize processing technology which further improves its quality, consumer acceptability, marketability of these products in bigger scale with future prospect. Further, these products can be recommended for fortification and subsequently release the same as a value added product in the market.

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Sl .No.	*Phytochemicals*	*Eleagnus latifolia chutney*	*Eleagnus latifolia ketchup*	*Hippophae salicifolia juice*	*Hippophae salicifolia jelly*
1.	*Total Antioxidant µg/ml*	*8.61±0.07*	*10.16±0.02*	*82.01±0.45*	*73.63±0.02*
2.	*Ascorbic acid mg/100g*	*5.88±0.67*	*7.54±0.43*	*30.53±0.86*	*28.04±0.89*
3.	*Toatal phenol mg g/GAE*	*19.07±0.34*	*21.55±0.57*	*69.26±0.06*	*51.92±0.05*
4.	*Total Flavonoids mg/g/QE*	*15.73±0.01*	*16.42±0.02*	*32.67±0.01*	*29.62±0.01*
5.	*Total Carotenoids mg/100g*	*2.84±0.06*	*2.96±0.005*	*3.16±0.01*	*2.00±0.09*
6.	*Total Anthocyanin mg/100g*	*0.31±0.01*	*0.36±0.005*	*0.25±0.01*	*0.07±0.005*

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