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RESEARCH ARTICLE

Retention of β -Carotene from Leafy Vegetables

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ABSTRACT

During the present investigations, effect of table salt on retention of β-carotene from leafy vegetables from Marathwada was studied. Getting vegetables throughout the year is obscure in rain feed area like Marathwada. Retention of nutrition from vegetables is important for health in absence of in adequate preservation techniques. Five different green leafy vegetables which are consumed by the peoples on large scale have been tried during the present piece of work. These vegetables are Spinach (*Spinacia oleracea L.*), Coriander (*Coriandrum sativum* L.), fenugreek (*Trigonella foenum-graecum* L.), Shepu (*Anathum graveolens L.) and* Cabbage (*Brassica oleracea var. capitata* L.) which are commonly consumed in Marathwada region. These vegetables were soaked with solution of common Table salt i.e. Sodium Chloride ($NaCl_2$) at different concentrations. After analysis it was noted that in Spinach, Coriander, *Trigonella* and Anthem. The results obtained during the work clearly indicate that, the common salt can act as excellent preservative for retention of β-carotene from leafy vegetables.

Keywords : Common Salt, β-carotene, Leafy Vegetables, Marathwada, Spectrophotometry

INTRODUCTION

The leafy vegetables are used as primary food source and in regular consumption in the diet of rural as well as urban area of Marathwada. These leafy vegetable can provide appreciable amount of nutrients in comparison to other fruit and seed plants. The forest dwellers collect and use various foliages as leafy vegetables. Leafy vegetables are easily collected by the poor tribal and rural people from the market and thus inexpensive, but are a good source of nutrients (Misra *et al.*, 2014). Vegetables are the cheapest and most easily available sources of important proteins, vitamins, minerals and essential amino acids. Vegetables are the fresh and edible portions of herbaceous plants, which can be eaten raw or cooked (Dhellot *et al.*, 2006). They contain valuable food ingredients which can be used as energy sources, body building, regulatory and protective material. These vegetables are valuable in maintaining alkaline reserve of the body. Vegetables are more important for their high content of carbohydrate, vitamin and mineral (Adeniyi *et al.*, 2012). The main focus of this research will be on some of the key advanced food preservation technologies that are now available and their effects on the beneficial components of fruits and vegetables. Other factors also influence on stability of nutrients and phytochemicals within fruit and vegetables. The preservation technology is having immense importance in meeting the global targets of fruit and vegetable consumption (Barrett *et al*., 2012).

MATERIALS AND METHODS

Preservation

Preservation methods like salting, dehydration and fermentation have been utilized for long period, whereas thermal processing and freezing technologies have developed more recently in the 20th century. The nutritional quality of canned and frozen fruits and vegetables as compared to their fresh parts may be more. Storage and cooking can lead to overall losses of up to half of the original nutrient content **(Rickman *et al.* 2007).**

Sample Collection

Five fresh leafy vegetables were collected from local markets in Aurangabad. The samples include Spinach (*Spinacia oleracea L.*), Coriander (*Coriandrum sativum L.*), Fenugreek (*Trigonella foenum-graecum L.*), Dill (*Anathum graveolens L.)* and Cabbage (*Brassica oleracea var. capitata L.*). Each vegetable was thoroughly washed with running tap water. The fresh leafy vegetables were soaked into different concentration of sodium chloride ($NaCl_2$) viz. 2%, 5%, 10% and 15%. These samples were also stored at room temperature, wrapped in cloth along with control sample. 1gm of sample was crushed with mortar and pestle by adding 10 ml mixture of acetone and petroleum ether until all pigment extracted. These extracts were filtered through muslin cloth followed by through Whatman filter paper. Final volume was made 100 ml by adding petroleum ether in it.

Extraction of β -Carotene:

Preparation of column: Columns were prepared by filling in it with 1:1 sodium sulphate and aluminum oxide up to 5 cm. This column was attached to fraction collecting tube duly attached to the suction pump.

Separation of β–carotene: 10 ml of aliquot was taken from sample and loaded on Column thoroughly. This was followed by addition 10 ml petroleum ether. All fractions were collected and among which some fraction was taken in cuvette and optical density was measured at 450 nm with single beam Systronics spectrophotometer. Experiments were carried out keeping three replicates. Finally calculations were carried out and result shown in observation table.

Reagents: All the chemicals and solvents used were of analytical reagent grade, petroleum ether & acetone.

RESULTS & DISCUSSION

During the present study, the role of common salt on retention of β-carotene in selected leafy vegetables was studied. Vegetables were treated with different concentration of $NaCl_2$ viz. 2%, 5%, 10%, and 15%, room temperature and also wrapped in wet cloth. These all treated vegetables were used for analysis of β-carotene in different time period. The vegetables such as Spinach was treated for 20, 36, 54 hrs, Coriander 12, 24, 72 hrs, Trigonella and Anathum 12, 24, 48 hrs and Cabbage 24, 48, 72 hrs.

After analysis of the β-carotenes it was noted that, amount of β-carotene extracted minimum in Spinach treated with 2% $NaCl_2$ sample, after 54 hrs shown **1.204** µg amount of β-carotene. Maximum amount of β-carotene was **4.760** µg in 15% $NaCl_2$ sample wrapped in cloth during 54 hrs (Table 1). In Coriander highest amount of β-carotene in sun dried sample in 12 hrs was **6.080** µg and lowest in 2% sample after 24 hrs amount of β-carotene was **2.080** µg (Table 2). The *Trigonella* shows more amount i.e. **6.928** µg of β-carotene after 24 hrs on 15% $NaCl_2$ store in room temperature and less **1.840** in control sample for 12 hrs (Table 3). *Anethum* contain highest amount of β-carotene which was **5.520** µg present in room temperature for 24 hrs and lowest amount of β-carotene noted was **2.324** µg in 15 % for 12 hrs treatment (Table 4). The table 5 shows highest β-carotene

0.440 in 15% $NaCl_2$ which was preserved in room temperature for 24 hrs and lowest amount of β-carotene i.e. **0.008** μg vegetable preserve in 10% $NaCl_2$ after 72 hrs in Cabbage.

Leafy vegetables or fruits are kept in salt they lose water by process exosmosis. Sugar, proteins, minerals and other substances from fruits and vegetables get dissolved in water. These dissolved substances are used as nutrients by lactic acid bacteria and other microorganisms. Salt induces plasmolysis in plant cells. This creates anaerobic conditions around submerged vegetables product. The lowest concentration of salt (5%) lactic acid bacteria grow rapidly and produce acid. This production of acid decreases as there is increase in salt concentration. But high salt concentration favours gas production. The combination of acid and salt restrict yeast and other gas formers **(Madeo *et al.,* 2004).**

Common salt is one of the most important preservatives in food preservation for centuries. It is employed on large scale, especially for vegetables, fish and meat. Salt has retained its importance in food preservation to the present day. For the vegetable products, salt is used as a alone intermediate products intended for further industrial processing, the main vegetables preserved in this way being asparagus, beans, cabbage, carrots, turnips, pearl onions, mushrooms. These are placed in salt solution of 15-25%, according to the vegetables concerned **(Lee & Kang 2004).**

The compositional changes that occurred on dehydration varied by the component, the vitamins, ascorbic acid and total and β- carotene were lost significantly, while thiamine was retained moderately. Changes in the anti nutritional factors were no significant. The process of dehydrating leafy vegetables concentrates the nutrients and the dehydrated leafy vegetables are a rich source of dietary fiber which can find application in development of high fiber and micronutrient rich foods. These vegetables easy to preserve, feasibility, convenience and availability are some of the advantages of incorporating dehydrated leafy vegetables **(Gupta *et al.*, 2013)**.

The nutrient in vegetables frozen versions of a given commodity presents viable substitutes for fresh in terms of nutritional value. While the results were highly dependent on commodity and nutrient, there were certain trends within the specific nutrients. In frozen samples of the commodities analyzed, riboflavin, α-tocopherol, and ascorbic acid were not only preserved in quantities equivalent to those of fresh samples, but in many cases were found in quantities much higher than those of the fresh vegetables (**Bouzari *et al.*,2015).**

CONCLUSIONS

Peoples do not eat in sufficient amount of nutritious fruit and vegetable products. The use of new, preservation methods create a unique opportunity for food preservation to retain nutrient content similar to that found in fresh fruits and vegetables. That utilizes common salt in vegetable preservation or storage. Depending on the fruit or vegetable of interest, and the preservation conditions and specific nutrients advanced technologies may have a positive, neutral or negative effect on nutrient retention, to properly address the impact of this preservation technology, common salt use for preserving fruits and vegetables such that nutrient losses are minimized as compared to the fresh counterpart of leafy vegetables and consumers are easily preserved nutrient in leafy vegetable products that they can consume any season.

The result is correlate with other workers clearly reflected the food value of vegetables. It was concluded that besides, major nutrients, β-carotene present in vegetables also contributes fairly good amount of vitamin A from carotenes. Hence it is suggested that the green leafy vegetables should be used in our daily diet.

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TABLE 1: EFFECT OF SODIUM CHLORIDE TREATMENT ON SPINACH FRESH OD-0.497

Treatment of $NaCl_2$ (%)	After 20 hrs		After 36 hrs		After 54 hrs	
	O.D. at 450 nm	Content of **β** carotene µg/ gm	O.D. at 450 nm	Content of **β** carotene µg/ gm	O.D. at 450 nm	Content of **β** carotene µg/ gm
Control	0.421	1.684	0.412	1.648	0.313	1.252
2	0.582	2.328	0.303	1.212	0.301	**1.204**
5	0.481	1.924	0.402	1.608	0.372	1.488
10	0.414	1.656	0.534	2.136	0.380	1.520
15	0.530	2.120	0.401	1.604	0.372	1.488
Wrapped in cloth	0.522	2.088	0.760	3.040	1.190	**4.760**
Room temp.	0.551	2.204	0.623	2.492	---	---

TABLE 2: EFFECT OF SODIUM CHLORIDE TREATMENT ON CORIANDER FRESH OD-0.659

Treatment of $NaCl_2$ (%)	After 12 hrs		After 24 hrs		After 72 hrs	
	O.D. at 450 nm	Content of **β** carotene µg/ gm	O.D. at 450 nm	Content of **β** carotene µg/ gm	O.D. at 450 nm	Content of **β** carotene µg/ gm
Control	0.731	2.924	0.642	2.568	0.601	2.404
2	0.690	2.760	0.520	**2.080**	0.793	3.172
5	0.542	2.168	0.871	3.484	0.670	2.680
10	0.701	2.804	0.583	2.332	0.652	2.608
15	0.763	3.052	0.661	2.644	0.690	2.760
Room temp.	1.021	4.084	1.230	4.920	0.541	2.164
Sun light	1.520	**6.080**	---	---	---	---

TABLE 3: EFFECT OF SODIUM CHLORIDE TREATMENT ON FENUGREEK FRESH OD-0.602

Treatment of $NaCl_2$ (%)	After 12 hrs		After 24 hrs		After 48 hrs	
	O.D. at 450 nm	Content of **β** carotene µg/ gm	O.D. at 450 nm	Content of **β** carotene µg/ gm	O.D. at 450 nm	Content of **β** carotene µg/ gm
Control	0.460	**1.840**	0.770	3.080	0.671	2.684
2	0.731	2.924	0.531	2.124	0.753	3.012
5	0.680	2.720	0.652	2.608	0.760	3.040
10	0.642	2.568	0.804	3.216	0.791	3.164
15	0.631	2.524	0.780	3.120	0.682	2.728
Room temp	1.110	4.440	1.732	**6.928**	1.090	4.360
Sun light	0.590	2.360	---	---	---	---

TABLE 4: EFFECT OF SODIUM CHLORIDE TREATMENT ON SHEPU FRESH OD-0.659

Treatment of $NaCl_2$ (100 ml Water)	After 12 hrs		After 24 hrs		After 48 hrs	
	O.D. at 450 nm	Content of β carotene µg/ gm	O.D. at 450 nm	Content of β carotene µg/ gm	O.D. at 450 nm	Content of β carotene µg/ gm
Control	0.860	3.440	0.902	3.608	0.951	3.804
2 gm	0.751	3.004	0.631	2.524	0.840	3.360
5 gm	0.862	3.448	0.740	2.960	0.682	2.728
10 gm	0.680	2.720	0.631	2.524	0.710	2.840
15 gm	0.581	**2.324**	0.643	2.572	0.832	3.328
Room temp.	1.120	4.480	1.380	**5.520**	0.991	3.964

TABLE 5: EFFECT OF SODIUM CHLORIDE TREATMENT ON CABBAGE FRESH OD-0.036

Treatment of $NaCl_2$ (100 ml Water)	After 24 hrs		After 48 hrs		After 72 hrs	
	O.D. at 450 nm	Content of β carotene µg/ gm	O.D. at 450 nm	Content of β carotene µg/ gm	O.D. at 450 nm	Content of β carotene µg/ gm
Control	0.034	0.136	0.062	0.248	0.005	0.020
2 %	0.035	0.140	0.051	0.204	0.013	0.052
5 %	0.033	0.132	0.090	0.360	0.014	0.056
10 %	0.032	0.128	0.042	0.168	0.002	**0.008**
15 %	0.031	0.124	0.035	0.140	0.010	0.040
Room temp.	0.110	**0.440**	0.050	0.200	0.050	0.200
Sun light	0.062	0.248	0.023	0.092	0.032	0.128

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