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Effect of steam blanching on quality of bottle gourd shreds

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Abstract
Bottle gourd (*Lagenaria siceraria*) is an important medicinal herb and vegetable crop of tropical and sub-tropical regions of the world belonging to the family *Cucurbitaceae*. Blanching inactivates the prevailing enzymes in the food which are responsible for the product quality loss. Hot water and steam are the most commonly used heating methods for blanching in industry. This study was undertaken to investigate the effect of steam blanching on bottle gourd shreds after inactivation of peroxidase enzymes. During blanching, the enzyme inactivation time was found 6.00, 7.50 and 8.30 min, in 3, 5 and 7 mm bottle gourd shreds, respectively. The quality parameters of bottle gourd shreds at various thickness and time with their interactions were studied. The total soluble solids was increased with blanching time increases and decreased with shreds thickness increases, however the combined effect was found non-significant. The ascorbic acid content was decreased significantly as shreds thickness and blanching time increases and their interaction were found highly significant ($P<0.05$). Heat sensitive ascorbic acid reduction was found more in 7 mm shreds after steam blanching. The juice yield was found increased significantly as shred thickness increases and decreased as blanching time increases indicating significant influence of independent parameter.

Keywords: Bottle gourd, shreds, steam blanching, ascorbic acid, TSS, juice yield

Introduction
The botanical name of medicinal herb bottle gourd is *Lagenaria siceraria* belonging to the family *Cucurbitaceae*. Bottle gourd also known as Calabash, Doodhi and Lauki in different parts of India [1]. The bottle gourd is also known in other places as white flowered gourd, trumpet gourd, calebassier, courage bouteille (French) cojombro, guiro amargo (Spanish); upo, talayag, gucuzzi, zucca melon (Philippines); mokwa, oo lo kwa (China) [2]. The bottle gourd fruit contains moisture content (94.5%), energy (15 cal), carbohydrates (2.9%), protein (1.2%), fat (0.2%), ash content (0.5%), fibre (0.7%), thiamine (0.03 mg), riboflavin (0.05 mg), niacin (0.3 mg) and ascorbic acid (12 mg) per 100 g. Minerals are important for vital body functions such as acid base and water balance [3]. Bottle gourd contains such mineral as calcium (12 mg), phosphorous (37 mg), sodium (1.7 mg), potassium (87 mg), chromium (0.05 mg), iron (0.8 mg) per 100 gm. Bottle gourd contains 1.6% choline; a precursor to acetylcholine, a chemical used to transfer nerve impulses and hence, it is believed to have neurological effects [4].

The bottle gourd fruit is having high medicinal value of considerable importance. It is used for preparation of different products like jelly and tutti fruity [5]. Bottle gourd also used for making of kofta, raita, pudding like halwa and kheer; sweets like peda and barfi. Fruit juice of bottle gourd with lime is applied on pimple. The seeds are boiled in salt water and consumed as an appetizer. In Ethiopia, the seeds are used in soup preparation [6]. Bottle gourd pulp is good for overcoming constipation, cough, night blindness and as an antidote against certain poison. Bottle gourd has immunomodulatory, hepatoprotective, antioxidant, analgesic, adaptogenic, analgesic, anti-inflammatory, anti-stress, cardio-protective, cardio-tonic, anti-hyperlipidemic, diuretic, aphrodisiac, alternative purgative, antidote to certain poisons and cooling properties [7].

Blanching is most important unit operation prior to freezing, canning or drying as it inactivates the enzymes which can cause loss of colour, flavour and texture. It brightens the colour and helps retard loss of vitamins. Blanching time is crucial and varies with the vegetables and size. Under blanching stimulates the activity of enzymes or is worse than no blanching. Over blanching causes loss of flavour, colour, vitamins and minerals [8]. Hot water and steam are the most commonly used methods for blanching in industry. The blanching systems depends on the product, the process following it and the final use of the product [9].

Materials and Methods

Raw material
Fresh light green, well matured bottle gourd were procured from local market to the laboratory. The experiments were carried out at The College of Food Processing Technology and Bio-Energy, Anand Agricultural University, Anand.

Sample preparation
After washing sorted and graded bottle gourds were cut along its vertical axis, seed portion were scooped out with the help of knife. Shreds were prepared using shredding machine having different required size shredding plates. Different thickness of shreds were maintained at 3, 5 and 7 mm with the help of this shredding machine.

Steam blanching
After preparation of shreds steam blanching was carried out to inactivate enzymes. Hot water bath and wire sieve were used for steam blanching of bottle gourd shreds. Approximately 100 g sample were placed in hot water bath, at interval of 1 min, sample were drawn continuously from water bath up to 8 min to check inactivation of peroxidase (POD) enzyme. Approximately 1 g blanched sample were drawn out and immediately cooled in cold water to stop the heating process. Unblanched sample was used as a control. After inactivation of enzymes, shreds were subjected to analyze for its TSS, ascorbic acid and juice yield.

Peroxidase (POD) test
Steam blanched bottle gourd shreds of different thicknesses were estimated for qualitative test to check inactivation of POD enzymes in it as described by Ranganna (1986) [10]. About 1 g of shreds were taken out into a test tube at every 1 min interval of steam blanching.

Estimation of quality
The total soluble solids of bottle gourd shreds were estimated using pocket hand refractometer having measuring range 0-53 °Brix. The ascorbic acid contents of different sized shreds were determined as mg/100g by visual titration method using 2, 6-dichlorophenol-indophenol as described in Ranganna (1986) [10]. The percent juice yield was estimated on the basis of weight of juice obtained per unit weight of blanched shreds as described by Jain and Khurdiya (2002) [11] using derived equation.

Results and Discussion

Control and blanched bottle gourd shreds
The control and blanched bottle gourd shreds were analysed before and after steam blanching to evaluate its quality and POD inactivation time. The obtained results were presented in Table 1.

Table 1: Control and blanched bottle gourd shreds quality and POD inactivation time

Shreds thickness (mm)	POD inactivation time (min)	Total soluble solids (°Brix)	Ascorbic acid (mg/100g)	Juice yield (%)
Control				
3	-	4.10 ± 0.00	9.80 ± 0.04	77.12 ± 0.18
5	-	4.00 ± 0.01	9.24 ± 0.00	79.40 ± 0.33
7	-	4.10 ± 0.00	9.24 ± 0.02	79.41 ± 0.23
Blanched				
3	6.0 ± 0.50	2.83 ± 0.05	7.08 ± 0.00	62.93 ± 0.26
5	7.5 ± 0.50	2.70 ± 0.10	6.77 ± 0.08	64.25 ± 0.34
7	8.3 ± 0.28	2.63 ± 0.05	6.26 ± 0.09	65.39 ± 0.19

Bottle gourd shreds were subjected to steam blanching to inactivate POD enzyme. Time required for POD inactivation was found 6, 7.5 and 8.3 min for 3, 5 and 7 mm shred thickness, respectively. Time required was less in 3 mm shreds thickness as compared to 5 and 7 mm indicated that as shred thickness (ST) increases, the blanching time (BT) for inactivation of POD enzyme was also increased. The obtained result might be due to more surface area of 3 mm shreds as compare to 5 and 7 mm shreds to expose fast penetration of steam at the centre. The total soluble solids was decreased as shreds thickness increased. Initially, the ascorbic acid content in control sample was 9.80 mg/100g and was decreased 27.75% in blanched 3 mm thick shreds. The juice yield was found increased as shred thickness increased in control and blanched samples might be due to less surface area of 7 mm shreds as compare to 3 and 5 mm shreds as to take minimum evaporation from the surface during prolong time before juicing.

Effect of steam blanching
The effect of steam blanching on quality parameters of bottle gourd shreds at various thickness and time with their interactions are presented in the statistically mean analysed data showed in Table 2.

Table 2: Statistically mean analysed data showing effect of shreds thickness and steam blanching time on various quality parameters

Treatment	Total soluble solids (ºBrix)	Ascorbic acid (mg/100g)	Juice yield (%)
Shreds Thickness (ST)			
ST_1	2.766	7.110	63.098
ST_2	2.616	6.895	64.671
ST_3	2.516	6.471	65.678
SEm	0.015	0.014	0.061
CD	0.044	0.041	0.177
Blanching Time (BT)			
BT_1	2.477	6.934	64.810
BT_2	2.577	6.853	64.698
BT_3	2.700	6.796	64.282
BT_4	2.777	6.718	64.140
SEm	0.018	0.014	0.070
CD	0.051	0.016	0.204

Interaction (ST*BT)			
SEm	0.030	0.028	0.121
CD	NS	0.082	NS
CV%	2.00	0.72	0.33

ST_1 = 3 mm, ST_2 = 5 mm, ST_3 = 7 mm, BT_1 = 2 min, BT_2 = 4 min, BT_3 = 6 min, BT_4 = 8 min

Effect of steam blanching on total soluble solids

The TSS was decreased as compared to raw bottle gourd shreds after stem blanching. TSS in bottle gourd shreds were decreases as the shred thickness increases. In 7 mm shreds thickness, TSS was minimum i.e. 2.63 °Brix and blanching time was higher i.e. 8.3 min whereas maximum TSS was found 2.83 °Brix in 3 mm shreds thickness and minimum blanching time i.e. 6 min. TSS in 5 mm shreds thickness was 2.70 °Brix and blanching time was 7.5 min (Table 1). The total soluble solids was govern independently with shreds thickness (ST) and blanching time (BT) and found significantly as showed in Table 2. However, the combined effect of shreds thickness and blanching time (ST*BT) was found non-significant. Decreased in TSS during steam blanching showed a progressive loss of solids with increase in thickness of shreds. The extent of loss in TSS from the bottle gourd shreds varied with different blanching time.

Effect of steam blanching on ascorbic acid content

The data obtained on the ascorbic acid content for control and blanched bottle gourd shreds were presented in Table 1. There was slight variation found in the ascorbic acid content among different sized shreds in control samples. The maximum ascorbic acid content of unbranched bottle gourd shreds was 9.80 mg/100g and decreased after blanching i.e 7.08, 6.77 and 6.26 mg/100g for 3, 5 and 7 mm shreds thickness respectively. The maximum ascorbic acid was found to be 7.08 mg/100g in 3 mm shreds thickness at 6 min blanching time. The ascorbic acid content was decreased significantly as shreds thickness (ST) and blanching time (BT) increases as showed in Table 2. The result and their interaction (ST*BT) were found highly significant (P<0.05). Heat sensitive ascorbic acid reduction in 7 mm thick shreds were more than the 3 mm thick shreds after steam blanching. The thermal lag causing heat expose in 7 mm shreds takes longer time to cool than 3 mm shreds, which may be a reason of losses of more ascorbic acid in it.

Effect of steam blanching on juice yield

The Juice yield of 3 mm control sample was 77.12% which decreased to 62.93% after 6 min blanching, similarly for 5 mm it was 79.40% which was decreased to 64.25% after 7.5 min blanching and for 7 mm, it was 79.41% which was decreased to 65.39% after 8.3 min blanching (Table 1). Shreds thickness (ST) and blanching time (BT) indicates that the juice yield was dependent individually on both the factor significantly as showed in Table 2. However, the their interaction (ST*BT) was found non-significant. Juice yield was decreased significantly after steam blanching might be due to leaching loss and softening of texture of the bottle gourd shreds thus makes juice extraction difficult. In 7 mm thick shreds, the juice yield was more than the 3 and 5 mm thick shreds after steam blanching which might be due to less surface area causing less evaporation of water.

Conclusions

Blanching is very important pre-treatment prior to further processing in most of the vegetables. Blanching prevents loss of colour, flavour and it inactivate the enzymes which is responsible for such problems. Steam blanching was optimized in bottle gourd shred based on POD inactivation time and then maximum TSS, maximum ascorbic acid content and minimum juice yield for further dehydration process. The best response was found in bottle gourd shreds having thickness of 3 mm and POD inactivation time at 6 min. At this combination, maximum TSS was found 2.83 ºBrix, maximum ascorbic acid content was found 7.08 mg/100g and minimum juice yield was found 62.93%. The obtained optimized process parameters were standardized, as it satisfies the statistical and physicochemical criteria for further dehydration.

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References

1. Deore SL, Khadabadi SS, Patel QR. *In vitro* antioxidant activity and quantitative estimation of phenolic content of Lagenaria siceraria. Rasayan J Chem. 2009; 2(1):129-132.
2. Axtell BL, Fairman RM. Minor oil crops, 1992. Retrieved from http://www.fao.org/docrep/X5043E/x5043E07.htm#Bottle%20gourd.
3. Hanif R, Iqbal Z, Iqbal M, Hanif S, Rasheed M. Use of vegetable as nutritional food: Role in human health. Journal of Agriculture and Biological Science. 2006; 1(1):1-5.
4. Thomas SC. Nutritional and therapeutic values of vegetables, In: Vegetables and fruits: nutritional and therapeutic values, chap. 1. CRC Press, London, United Kingdom, 2008.
5. Salunkhe DK, Kadam SS. Pumpkin, squashes and gourds, In: Handbook of vegetable science and technology, chap. 11, Marcel Dekker Inc., New York. 1998, 279-282.
6. Dhaliwal MS. Handbook of vegetable crops. Kalyani Publishers. 2017, 115-119.
7. Ahmad I, Irshad M, Rizvi MMA. Nutritional and medicinal potential of *Lagenaria siceraria*. International Journal of Vegetable Science. 2011; 17(2):157-170.
8. Anonymous. Freezing, blanching, national centre for home food preservation. 2018; Retrieved from https://nchfp.uga.edu/how/freeze/blanching.html.
9. Reyes De Corcuera JI, Cavalieri RP, Powers JR. Blanching of foods. Encyclopedia of Agricultural, Food and Biological Engineering. 2004; DOI: 10.1081/E-EAFE-120030417.
10. Ranganna S. Handbook of analysis and quality control for fruit and vegetable products. Second edition, Tata McGraw-Hill Publications; New Delhi, India. 2004, 1-1152.
11. Jain SK, Khurdiya DS. Studies on juice extraction of aonla (*Emblica officinalis* Gaertn.) cv. 'Chakaiya', Journal of Food Science and Technology. 2002; 39(5):515-516.