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Short communication

Effect of blanching on the quality of dehydrated cauliflower

R. Neelavati, R.K. Pal*, Sangita Sen and P. Kumar
Division of Post Harvest Technology, NRL Building, Indian Agricultural Research Institute, New Delhi 110 012

ABSTRACT

For dehydration of cauliflower a study was undertaken in cvs. Pusa Sharad, Pusa Hybrid-2 and Pusa Himjyoti. All the samples were then subjected to boiling in the microwave oven and the electrical conductivity readings were recorded after cooling at 25°C. Time of blanching was standardized as 4, 7 and 5 min. for water, steam and microwave blanching, respectively. Cauliflower florets were dipped in hot water (90 ± 5°C) for 4 min. during water blanching. For steam blanching, florets, taken in wire mesh sieve, were placed above a vessel containing boiling water for 7 minutes. The temperature during blanching was 90 ± 2°C. Microwave blanching was done using domestic microwave. Steam blanching retained higher level of quality and ascorbic acid followed by microwave and water blanching. Pusa Sharad exhibited the best performance among the cultivars. Pusa Sharad and Pusa Hybrid-2 were found superior to Pusa Himjyoti on rehydration.

Key words: Blanching, cauliflower, dehydration, quality.

Cauliflower (*Brassica oleracea* L. var. *botrytis*), one of the most important cruciferous vegetable, is a power house of health promoting phytochemicals such as glucosinolates, vitamin C and phenolic compounds. Glucosinolates are unique class of sulphur containing glycosides responsible for characteristic flavour. These secondary metabolites are known to have chemoprotective activity against cancer (Wallsgrove *et al*., 1; Renuka and Thangam, 2).

Appropriate processing techniques are needed to utilize the abundant supply of cauliflower during peak season resulting a huge glut in the market accompanied by severe post harvest loss in terms of physical as well nutraceutical properties. It would thereby help to reduce the post harvest loss. Conventionally dried vegetables (*i.e.*, without blanching) could be stored only for a short time. This is due to the unacceptable in colour, flavour, texture and nutritional quality brought about by the action of several enzymes. These undesirable enzymes could be denatured by blanching prior to dehydration. In such products texture, colour, flavour and nutritional quality are better retained. Different methods of blanching like water blanching, steam blanching, microwave blanching, individual quick blanching, fluidized blanching and hot gas blanching have been successfully used in different vegetables. The enzyme peroxidase served as the indicator enzyme for determining the adequacy of blanching for cauliflower (Srivastava and Nath, 3) and carrot (Ramesh *et al*., 4). Similarly, retention of vitamin-C in the dehydrated product is also another hidden quality attribute apart from other phytochemicals. Hence, a study was undertaken.

*Corresponding author's present address: NRC on Pomergranate, Solapur, Maharashtra; E-mail: rkrishnapal@gmail.com

Freshly harvested curds of uniform size and maturity of three cauliflower varieties namely Pusa Sharad, Pusa Hybrid-2 and Pusa Himjyoti were obtained from the Unit of Vegetable Research and Demonstration, IARI, New Delhi. The outer leaves of curds were removed immediately after harvest followed by tap water washing. Time of blanching was standardized based on the peroxidase activity. Time of blanching was standardized as 4, 7 and 5 min. for water, steam and microwave blanching, respectively. Cauliflower florets were dipped in hot water (90 ± 5°C) for 4 min. during water blanching. For steam blanching, florets, taken in wire mesh sieve, were placed above a vessel containing boiling water for 7 minutes. The temperature during blanching was 90 ± 2°C. Microwave blanching was done using microwave of Sanyo Japan. The florets and water were taken in the ratio of 2:1 and the temperature inside the microwave was set to 80°C and blanching was done for 5 min. After blanching, florets were cooled in tap water for 2 min. Excess water was drained off. Florets were dried and evaluated for quality parameters.

Ascorbic acid was determined by titrating the sample with 2, 6 dichlorophenol indophenol dye using metaphosphoric acid as stabilizing agent (AOAC, 5). To asses electrolyte leaching, five discs each with 10 mm diameter and 2 mm thickness were cut using a cork borer and placed in 50 ml of 0.3 M sucrose solution for each replicate. All the beakers including the blank (only 0.3 M sucrose) were placed in a circulating water bath at 25°C. The initial reading of the samples including the blank was recorded after 2 h of incubation in the water bath at 25°C. All the samples were then subjected to boiling in the microwave oven and the electrical conductivity readings were recorded after cooling at 25°C with the help of a digital conductivity meter (Elico, India) to determine the total electrolyte content.

Ten grams of fresh card samples were dried in a hot air oven at 60-65°C. The dry weights of the sample were recorded at an interval of 24 h until two consecutive readings became same. The percentage of moisture content was calculated then the cauliflower florets were dehydrated in a cabinet drier using standard procedure. Five grams of the dehydrated floret was taken into a beaker containing 50 ml warm (60°C) water. The drained weight of the rehydrated material was taken after 2 h to calculate rehydration ratio. One gram of dehydrated sample was added to water blank to prepare dilutions up to 10^{-3}. Bacterial and fungal count recorded. The results were expressed as colony forming unit (CFU) per gram of sample.

Steam blanching retained higher level of ascorbic acid followed by microwave and water blanching. Pusa Sharad exhibited the best performance among the cultivars (Table 1). Low membrane permeability in this cultivar was responsible for minimizing the leaching loss which is the main mechanism of ascorbic acid loss. Though thermal degradation of ascorbic acid occurs, the remarkable stability could probably due to inactivation of ascorbic acid oxidase (Lathrop and Leung, 6) in steam blanching. Significantly high electrolyte leakage was observed in steam blanching while microwave blanching exhibited the least leakage. Pusa Hybrid-2 showed the least electrolyte leakage among the cultivars (Table 1). Water blanching might have heavily ruptured the cells and damaged the middle lamella leading to cell separation and high permeability of the membrane through which pectic substances and electrolytes might have leached out. Dehydrated florets had significantly higher levels of moisture content irrespective of the type of blanching treatments as compared to control (Table 2). This might be due to the inhibitory effect of blanching treatments on moisture removal during dehydration of cauliflower and the gel formation on pectic substances of cell membrane that hindered the water removal (mass flow) from the cell. Similar findings had been reported by Bakshi *et al*. (7) in cauliflower. Rehydration ratio of microwave blanched florets was significantly higher among all treatments including control. Pusa Sharad and Pusa Hybrid-2 showed superior rehydration as compared to Pusa Himjyoti (Table 2). Rehydration ratio of dehydrated florets significantly increased in microwave blanching. This might be attributed to better water absorption due to increased porousness of the cell wall in dehydrated florets. Similar report of enhanced rehydration due to blanching was observed in cabbage by Mulay *et al*. (8) and in cauliflower by Bakshi *et al*. (7). Pusa Sharad and Pusa Hybrid-2 were found superior to Pusa Himjyoti on rehydration. This could be due to the difference in the amount of imbibing materials such as carbohydrate, protein, pectin and fibre contents.

All blanching treatments had significantly low count

Table 1. Effect of blanching on electrolyte leakage (%) and ascorbic acid (mg/ 100 g) content of cauliflower.

Parameter	Treatment	Pusa Sharad	Pusa Hybrid-2	Pusa Himjyoti	Mean
Electrolyte leakage (%)					
	Control (unblanched)	11.18	10.05	15.00	12.11
	Water blanching	62.49	61.11	56.82	56.04
	Steam blanching	58.03	53.28	66.97	63.52
	Microwave blanching	53.21	50.13	55.49	52.94
Mean		46.23	43.64	48.57	
Ascorbic acid (mg/100 g)					
	Control (unblanched)	61.98	54.23	48.08	54.76
	Water blanching	37.93	31.46	28.69	32.69
	Steam blanching	47.20	39.78	36.08	41.02
	Microwave blanching	42.66	36.08	34.22	37.63
Mean		47.43	40.39	36.77	
CD at 5%					
Treatment	= 5.51			= 1.62	
Cultivar	= 1.92			= 1.62	
Treatment × Cultivar	= 9.54			= 1.62	

Table 2. Effect of blanching on moisture content (%) and rehydration ratio of the dehydrated cauliflower.

Parameter	Treatment	Pusa Sharad	Pusa Hybrid-2	Pusa Himjyoti	Mean
Moisture content (%)					
	Control (unblanched)	4.57	4.55	4.55	4.56
	Water blanching	4.82	4.83	4.82	4.82
	Steam blanching	4.81	4.81	4.82	4.81
	Microwave blanching	4.84	4.84	4.83	4.84
Mean		4.76	4.76	4.76	
Rehydration ratio					
	Control (unblanched)	5.32	5.19	4.26	4.92
	Water blanching	5.36	5.22	4.33	4.97
	Steam blanching	5.32	5.22	4.33	4.96
	Microwave blanching	5.45	5.23	4.36	5.01
Mean		5.11	5.22	4.32	
CD at 5%					
Treatment	= 0.13			= 0.04	
Cultivar	= 0.09			= 0.12	
Treatment × Cultivar	= 0.17			= 0.24	

of bacteria (*i.e.*, safe level of bacterial population) as compared to control and all the treatments were found to be at par with each other irrespective of the cultivars. Blanching of tomatoes reduced the bacterial population below detectable level after dehydration (Yoon *et al.*, 9). However, the bacterial count was found to be less in dehydrated cauliflower when microwave blanching was given. Microwave blanching given to Pusa Sharad was found effective for maintaining quality parameters.

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