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EFFECT OF TEMPERATURE AND BLANCHING METHODS ON DRYING OF BROCCOLI VAR. SADHANA

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ABSTRACT

A study was conducted for processing dried broccoli var. Sadhana for extension of shelf life since broccoli is a highly perishable crop and shows a short shelf life in fresh condition. Harvested broccolis were prepared for drying by blanching in hot water for 30 seconds (sec) and 1 minute (min), steam blanched at 1 and 2 min, microwave blanched in 800W (watt) for 30 sec and 1 min for different samples followed by washing in cool water and dried in two temperatures 55 and 60^{o}Celcius till constant weight is obtained. Dried broccoli with different treatments were packed in plastic zipper bags and stored in cool and dark condition for 5 months for storage studies at regular intervals to study rehydration ratio and sensory analysis (colour, smell, texture and overall acceptability) of the dried product. The overall acceptability was maximum in steam blanched broccoli at the end of the storage period during the storage study.

Keywords: Blanching, Broccoli, Drying, Rehydration ratio, Sensory analysis

Broccoli (*Brassica oleracea* L. var *italica*) is an exotic important vegetable composed of hundreds of immature florets arranged in whorls on a fleshy stem. Broccoli floret is an immature flower covered by chlorophyll-containing sepals, and the fast yellowing of the heads was due to degradation of chlorophyll during storage (Tian *et al.,*1994; Pogson *et al.,* 1995). Common problems of harvested broccoli are deterioration with yellowing, water loss, and wilting. Quality loss during prolonged storage occurs due to the phenomenon of yellowing of buds,wilting of leaves and loosening or opening of buds, and decay. The most common feature in broccoli postharvest senescence is degreening of sepal due to degradation of chlorophyll.

Drying is one of the most important methods for long term preservation. Dried fruits and vegetables need to be blanched first with steam or hot water in order to inactivate enzymes. Drying is a common process to expel moisture from, in order to prevent microbiological growth and enzyme activity, thereby enhancing the storage stability. In addition to enzyme inactivation, altered nutrient content such as ascorbic acid after blanching is an important factor to consider for the production of high-quality dried products. By extending the shelf life without the need for refrigeration or freezing, drying allows the consumption of vegetables out of season (Cohen and Yang, 1995). Dried vegetables can be reconstituted for a cooked side dish, or used in soups, sauces, stews, casseroles and stuffings. Vegetables are usually dried after blanching. Recently, it was reported by Gawlik (2008) that boiling of fresh broccoli significantly decreased in polyphenol content. Both microwaving and conventional cooking of broccoli with water decrease antioxidant components and activity in broccoli. Blanching is a process of exposing vegetables or fruits to high temperatures for a short period. Hence, the research was carried out to determine the changes during the storage period of dried broccoli with different blanching methods with drying temperature to help in determination of the best dried broccoli.

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MATERIALS AND METHODS

Harvesting was done when broccoli heads cv. Sadhana were fully grown but tender and dark green in colour with unopened florets weighing about 500-600g. They were brought to the Post Harvest Management of Horticultural Crops laboratory, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, West Bengal from the field of Horticultural Research Station, Mondouri, West Bengal immediately. Leaves and stalks were trimmed after cooling in room condition for 3 hours. Then they were chopped into pieces of size 5 × 2.5cm and blanched by different methods as follows:

T_1 -Hot water blanching for 30sec

T_2 -Hot water blanching for 1min

T_3 -Steam blanching for 1min

T_4-Steam blanching for 2min

T_5-Microwave blanching in power output 800W for 30 sec

T_6 -Microwave blanching in power output 800W for 1min

T_7- control

After blanching, the samples were steeped in cool flowing water to stop the cooking process. They were spread evenly on plate lined with tissue for few minutes to remove moisture adhering on the surface of broccoli pieces increasing the drying process.Consequently, they were placed in a cabinet drier at 55˚C(D_1) and 60 ˚C(D_2). After attaining the constant weight for each sample, they were packed in plastic zipper bags of dimension 20cm length and 12 cm breadth 200 gauge LDPE and stored in cool and dark room condition for 5 months (19-38.9ºC and RH 100-79%) and storage studies were carried out with regular intervals during the 5 months' storage period.

Factorial CRD (Completely Randomised Design) was followed. Dried broccoli florets were rehydrated by immersion in 50 ml of warm (60ºC) water in a beaker for 30 minutes. Prior to weighing, the sample was taken out of the bath and allowed to drain for 30sec to eliminate the adhering water on the surface (Ranganna, 1989).

$$\text{Rehydration ratio} = \frac{\text{Final weight after absorption}}{\text{Initial dry weight}}$$

Sensory Analysis

Sensory quality indices such as colour, smell,texture and overall acceptability were evaluated. The intensity of the attributes evaluated was quantified on a scale from 1 to 5 point hedonic scale. The sensory analysis was carried out among random untrained panel to consider the general acceptance of the product for the consumer.

Rating on fresh broccoli were rated as follows:

a. Colour

5 = green

4 = slight faded green

3 = moderately faded

2 = severely faded

1 = extremely faded

b. Smell

5 = likable

4 = moderately likeable

3 = dislike

2 = moderately dislike

1=extremely dislike

c. Texture

5 = crispy

4 = little rubbery

3 = rubbery

2 = very soft

1=extremelysoft

d. Overall acceptability

5 = acceptable moderately

4 = acceptable slightly

3 = neither acceptable nor unacceptable

2 = unacceptable slightly

1 = unacceptable moderately

RESULTS AND DISCUSSION

Rehydration ratio

It was observed from Table 1 that blanching treatments gave significant variation on rehydration ratio of dried broccoli during the storage study. Initially the highest rehydration ratio was recorded in unblanched broccoli before storage which showed the highest ratio upto month 3 from 7.87 to 4.78 after which the highest ratio was noted in steam blanched broccoli for 1 min (T_3) on month 4, while on month 5, steam blanched broccoli for 2min (T_4) gave the highest score (3.67).

The effect of drying temperature on rehydration ratio was significantly high in broccoli dried at 55ºC (D_1) compared to drying at 60ºC (D_2) at different days of storage. Rehydration ratio decreased gradually with the increase in storage duration. On month 5, rehydration ratio of 3.28 and 2.73 were recorded in D_1 and D_2 respectively, while rehydration ratio was significantly higher in D_1 than D_2 throughout the storage.

Interaction effect of blanching and drying temperature on rehydration was significant on different days of storage except on month 4. Rehydration ratio of unblanched broccoli at 55ºC was significantly higher (7.87) just before storage and continued till month 3 compared to other treatments followed by microwave blanching and dried at 55ºC **(**T_5D_1), Hot water 30 secand dried at 55ºC (T_1D_1), Microwave blanch 30 sec and dried at 55ºC (T_4D_1**)** and so on in decreasing order. Rehydration ratio decreased with storage period and on month 5, rehydration was maximum in Microwave blanch 30 sec and dried at 55ºC (T_4D_1) and minimum in Hot water 1min and dried at 55ºC (T_2D_1).

The rehydration ratio of dried broccoli followed a decreasing trend for all dried broccoli during the 5 months' storage studies. Highest rehydration ratio was seen in steam blanched for two minutes and dried broccoli at 55ºC while the least in hot water blanched for 1 min at the end of storage period whereas for drying broccoli at 60ºC, the maximum rehydration ratio was recorded in steam blanched for 2 minutes while the least rehydration ratio was recorded in hot water blanched broccoli for 1 minute. High rehydration may be due to better water absorption due to increased porousness of the cell wall in dehydrated florets (Neelavati *et al*., 2013). Enhanced rehydration due to blanching was observed in cabbage

Table 1. Effect of dehydration technique on rehydration ratio of dried broccoli cv. Sadhana

Effect of Blanching	Drying temperature	Storage period (in months)				
		Before storage	1	3	4	5
Hot water 30 sec		5.27	4.57	4.15	2.73	2.65
Hot water 1 mi		4.50	4.42	4.28	2.92	2.50
Steam 1min		5.35	5.00	4.70	3.32	2.87
Steam 2min		5.43	4.80	3.83	2.88	3.67
Microwave 30 sec		6.15	5.13	4.67	3.25	3.45
Microwave 1min		5.20	4.90	4.75	2.75	2.83
Control (Unblanched)		7.87	5.62	4.78	2.63	3.03
SEm(±)		0.03	0.03	0.03	0.04	0.12
CD(0.05%)		0.08	0.09	0.08	0.11	0.37
Effect of Temperature						
	55°C(D_1)	6.17	5.38	4.65	2.89	3.28
	60°C(D_2)	4.81	4.48	4.26	2.96	2.73
SEm(±)		0.02	0.02	0.01	0.02	0.07
CD(0.05%)		0.04	0.05	0.04	0.06	0.22
Effect of Interaction						
Hot water 30 sec	55°C(D_1)	6.17	5.10	4.53	2.63	2.63
Hot water 1 min		4.50	4.37	4.23	2.90	2.43
Steam 1min		5.73	5.27	4.87	3.27	3.13
Steam 2min		6.00	5.53	4.13	2.90	4.20
Microwave 30 sec		7.33	5.53	4.80	3.23	4.20
Microwave 1min		5.57	5.27	4.93	2.70	3.03
Control(unblanched)		7.87	6.57	5.03	2.60	3.33
Hot water 30 sec	60°C(D_2)	4.37	4.03	3.77	2.83	2.67
Hot water 1 min		4.73	4.47	4.33	2.93	2.57
Steam 1min		4.97	4.73	4.53	3.37	2.60
Steam 2min		4.87	4.07	3.53	2.87	3.13
Microwave 30 sec		4.97	4.73	4.53	3.27	2.70
Microwave 1min		4.83	4.63	4.57	2.80	2.73
Control (unblanched)		4.93	4.67	4.53	2.67	2.73
SEm(±)		0.04	0.04	0.04	0.05	0.18
CD(0.05%)		0.12	0.12	0.11	NS	0.25

Note- NS= non significance

by Mulay *et al*. (1994) and cauliflower by Bakshi *et al*. (1995). Sanjuan *et al*. (2003) also reported decreasing rehydration capacity of dried broccoli sample at 40ºC followed deceasing trend with storage time. During dehydration, there may beirreversible rupture and dislocation witha loss of integrity and hence a dense structure of collapsed, greatly shrunken capillaries with reduced hydrophilic properties as shown by the inability to rehydrate fully (Lewicki, 1998). There was difficulty of restoring the dried date to their fresh state due to cell disruption which took place during drying. Gupta and Sehgal (2005) have also reported decreased in rehydration ratio of dehydrated cauliflower with the advent of storage period where as browning did not change with the storage period.

Sensory evaluation

Colour

From Table 2, it was indicated that colour score of dried broccoli decreased with the progress of storage duration with significant differences among all the

Table 2. Effect of dehydration technique on sensory characteristic of colour of dried broccoli cv. Sadhana

Effect of Blanching	Drying temperature	Storage period (in months)			
		1	3	4	5
Hot water 30 sec		5.00	4.87	4.05	3.38
Hot water 1 min		4.90	4.60	3.82	3.35
Steam 1min		4.83	4.10	3.52	2.77
Steam 2min		4.92	4.05	3.28	2.25
Microwave 30 sec		4.87	3.65	3.35	2.47
Microwave 1min		4.90	3.28	2.50	1.83
Control (Unblanched)		4.87	3.17	3.17	1.80
SEm(±)		0.07	0.17	0.13	0.19
CD(0.05%)		NS	0.48	0.37	0.57
Effect of Temperature					
	55°C(D_1)	4.90	4.00	3.53	2.71
	60°C(D_2)	4.89	4.12	3.24	2.39
SEm(±)					
CD(0.05%)					
Effect of Interaction					
Hot water 30 sec	55°C(D_1)	4.90	4.67	4.37	3.60
Hot water 1 min		4.83	4.70	4.03	3.43
Steam 1min		4.93	4.30	3.87	2.83
Steam 2min		4.87	4.73	4.00	2.67
Microwave 30 sec		4.90	3.50	3.37	2.67
Microwave 1min		4.87	2.83	2.40	1.83
Control(unblanched)		5.0	3.17	2.67	1.90
Hot water 30 sec	60°C(D_2)	4.90	4.97	3.73	3.17
Hot water 1 min		4.83	4.50	3.60	3.27
Steam 1min		4.90	3.90	3.17	2.70
Steam 2min		4.87	3.37	2.57	1.83
Microwave 30 sec		4.90	3.80	3.33	2.27
Microwave 1min		4.87	3.73	2.60	1.83
Control(unblanched)		5.0	4.60	3.67	1.70
SEm(±)		0.09	0.23	0.18	0.28
CD(0.05%)		NS	0.68	0.53	NS

Note- Colour score:5 = green; 4 = slight faded green; 3 = moderately faded; 2 = severely faded; 1 = extremely faded, NS= non significance

treatments. Throughout the storage period, the highest score was significantly high in broccoli hot water blanched for 30 sec (T_1) followed by broccoli hot water blanched for 1 min (T_2) while the lowest score was recorded in unblanched broccoli (T_7) with a score of 1.80 on the last month of the storage period.

It was also observed that drying broccoli at 55ºC (D_1) gave higher colour scores of 3.53 and 2.71 on 3 and 4 months after storage than drying at 60ºC(D_2) with score of 2.39 on the last month of the storage period.

The interaction effect of blanching treatment and drying temperature on colour score of dried broccoli was significant high in hot water 30 secand dried at 60ºC (T_1D_2) on 3 months after storage while hot water 30 secand dried at 55ºC (T_1D_1) showed highest colour score on 4 and 5 months after storage**.** The colour score decreased with the storage period, so the minimum colour score was recorded in control, 60ºC (T_7D_2).

Colour was best retained in hot water blanched broccoli for 30 seconds, dried at 55°C while the

Table 3. Effect of dehydration technique on sensory characteristic of smell of dried broccoli cv. Sadhana

Effect of Blanching	Drying temperature	Storage period (in months)			
		1	3	4	5
Hot water 30 sec		4.90	4.80	4.05	3.70
Hot water 1 min		4.87	4.60	3.68	3.12
Steam 1min		4.93	4.10	3.52	2.93
Steam 2min		4.87	4.05	3.28	2.50
Microwave 30 sec		4.90	3.65	3.35	2.77
Microwave 1min		4.87	3.28	2.50	2.08
Control (Unblanched)		5.00	3.88	3.17	2.57
SEm(±)		0.06	0.17	0.12	0.12
CD(0.05%)		NS	0.49	0.35	0.35
Effect of Temperature					
	55°C(D_1)	4.90	4.00	3.53	2.90
	60°C(D_2)	4.91	4.11	3.20	2.72
SEm(±)		0.03	0.09	0.06	0.06
CD(0.05%)		NS	NS	0.18	NS
Effect of Interaction					
Hot water 30 sec	55°C(D_1)	4.90	4.77	4.37	3.93
Hot water 1 min		4.83	4.70	4.03	3.33
Steam 1min		4.93	4.30	3.87	3.17
Steam 2min		4.87	4.73	4.00	2.83
Microwave 30 sec		4.90	3.50	3.37	3.00
Microwave 1min		4.87	2.83	2.40	1.83
Control(unblanched)		5.00	3.17	2.67	2.17
Hot water 30 sec	60°C(D_2)	4.90	4.83	3.73	3.47
Hot water 1 min		4.90	4.50	3.33	2.90
Steam 1min		4.93	3.90	3.17	2.70
Steam 2min		4.87	3.37	2.57	2.17
Microwave 30 sec		4.90	3.80	3.33	2.53
Microwave 1min		4.87	3.73	2.60	2.33
Control(unblanched)		5.00	4.60	3.67	2.97
SEm(±)		0.09	0.24	0.17	0.17
CD(0.05%)		NS	0.69	0.49	0.49

Note- Score for smell :5 = likable; 4 = moderately likeable; 3 = dislike; 2 = moderately dislike;1 = extremely dislike, NS= non significance

maximum score for colour was in hot water blanched broccoli for 1 minute and dried at 60°C.The sensory scores for different attributes gradually decreased with the storage progressin dried dates (Kulkarni *et al*., 2008) and sensory quality of dehydrated dates remained acceptable during 6 months storage at room temperature.Better color in microwave samples compared to control was in agreement with Orikasa *et al*. (2012) where microwave blanching of tomato is considered to prevent quality deterioration of tomato samples with regard to parameters including nutrient and sample color.

Smell

Table 3 showed significant effect of blanching treatments on smell score of dried broccoli during the storage period though there was no significant effect on the first month. Colour score steadily decreased on storage and on month 5 it was 2.08 in microwave blanched for 1 min and 3.70 in broccoli hot water blanched for 30 sec (T_1) followed by hot water blanched for 1min- T_2 (3.12).

Table 4. Effect of dehydration technique on sensory characteristic of texture of dried broccoli cv. Sadhana

Effect of Blanching	Drying temperature	Storage period (in months)			
		1	3	4	5
Hot water 30 sec		5.00	4.80	4.52	3.55
Hot water 1 min		4.97	4.80	3.95	3.13
Steam 1min		5.00	4.75	4.20	3.35
Steam 2min		4.97	4.78	4.15	2.97
Microwave 30 sec		5.00	4.55	3.75	3.07
Microwave 1min		5.00	4.43	3.42	2.88
Control (unblanched)		5.00	4.52	3.32	2.62
SEm(±)		0.01	0.11	0.09	0.18
CD(0.05%)		NS	NS	0.26	0.51
Effect of Temperature					
	55°C(D_1)	4.98	4.59	3.82	2.99
	60°C(D_2)	5.00	4.79	3.98	3.18
SEm(±)		0.07	0.06	0.05	0.09
CD(0.05%)		NS	0.17	0.14	NS
Effect of Interaction					
Hot water 30 sec	55°C(D_1)	5.00	4.67	4.40	3.47
Hot water 1 min		4.93	4.77	4.07	3.23
Steam 1min		4.93	4.67	4.40	3.03
Steam 2min		5.00	4.77	4.60	2.50
Microwave 30 sec		5.00	4.43	3.73	3.20
Microwave 1min		5.00	4.43	2.60	2.80
Control(unblanched)		5.00	4.37	2.97	2.67
Hot water 30 sec	60°C(D_2)	5.00	4.93	4.63	3.63
Hot water 1 min		5.00	4.83	3.83	3.03
Steam 1min		5.00	4.83	4.00	3.67
Steam 2min		5.00	4.80	3.70	3.43
Microwave 30 sec		5.00	4.67	3.77	2.93
Microwave 1min		5.00	4.83	4.23	2.97
Control(unblanched)		5.00	4.67	3.67	2.57
SEm(±)		0.01	0.15	0.13	0.25
CD(0.05%)		NS	NS	0.37	NS

Note- Score for Texture:5 = crispy; 4 = little rubbery; 3 = rubbery; 2 = very soft; 1 = extremely soft. NS= non significance

Drying temperature gave no significant variation on colour score of dried broccoli during the storage study, although lower temperature drying at 55ºC(D_1) showed higher colour scores on 1,3 and 4 months after storage as compared to drying at higher temperature during the storage period.

Significant effect of interaction of blanching type and drying temperature on colour score exhibited during the storage period except on 1 month after storage. Hot water 30 sec and dried at 55ºC (T_1D_1) showed maximum colour range of 4.77 to 3.93 from 3 to 5 months after storage followed by Hot water 30 sec, 60ºC (T_1D_2), hot water 1min and dried at 55ºC (T_2D_1),control and dried at 60ºC (T_7D_2) and so on in decreasing order. There was decrease in colour score with storage hence the lowest scores of 2.83, 2.40 and 1.83 were recorded in broccoli blanched by microwave 1 min and dried at 55ºC (T_6D_1) interaction effect of treatments and drying temperature gave significant variation among the combinations.

Good score for dried broccoli in 55°C and 60°C was

Table 5. Effect of dehydration technique on sensory characteristic of overall acceptability of dried broccoli cv. Sadhana

Effect of Blanching	Drying temperature	Storage period (in months)			
		1	3	4	5
Hot water 30 sec		5.00	4.98	4.17	3.68
Hot water 1 min		5.00	4.92	4.03	3.53
Steam 1min		5.00	4.92	4.07	3.70
Steam 2min		4.98	4.95	3.92	3.68
Microwave 30 sec		5.00	4.93	3.92	3.65
Microwave 1min		5.00	4.98	3.73	3.46
Control (Unblanched)		4.98	4.68	3.67	3.28
SEm(±)		0.01	0.11	0.03	0.06
CD(0.05%)		NS	NS	0.09	0.17
Effect of Temperature					
	$55^{O}C(D_1)$	5.00	4.86	4.14	3.43
	$60^{O}C(D_2)$	4.98	4.87	3.71	3.71
SEm(±)		0.01	0.06	0.02	0.03
CD(0.05%)		NS	NS	0.05	0.09
Effect of Interaction					
Hot water 30 sec	$55^{O}C(D_1)$	5.00	5.00	4.53	3.57
Hot water 1 min		5.00	5.00	4.43	3.43
Steam 1min		5.00	5.00	4.17	3.43
Steam 2min		5.00	5.00	3.96	3.50
Microwave 30 sec		5.00	5.00	4.07	3.53
Microwave 1min		5.00	4.50	3.93	3.40
Control(unblanched)		5.00	4.50	3.90	3.13
Hot water 30 sec	$60^{O}C(D_2)$	5.00	4.97	3.80	3.80
Hot water 1 min		4.98	4.83	3.63	3.63
Steam 1min		5.00	4.83	3.97	3.97
Steam 2min		4.97	4.90	3.87	3.87
Microwave 30 sec		5.00	4.87	3.77	3.77
Microwave 1min		5.00	4.83	3.53	3.53
Control(unblanched)		4.97	4.87	3.43	3.43
SEm(±)		0.02	0.15	0.05	0.08
CD(p=0.05)		NS	NS	0.13	NS

Note- Score for Overall acceptability: 5 = acceptable; 4 = slightly acceptable; 3 = moderately acceptable; 2 = dislike; 1 = extremely dislike, NS= non significance

observed in hot water treatment for 30 seconds at the end of the storage period. As a consequence of storage of dried broccoli at 40°C, quality loss reaction rates are higher at this temperature and thus degradation is more evident and accelerated aging process (Sanjuan *et al*., 2004) which might have been responsible for the decrease in natural unique smell of broccoli. Shorter drying times and pretreatments used give products with very good organoleptic properties, good colour and good rehydration times (Bobic´*et al*., 2002).

Texture

The effect of blanching was significant only on 4 and 5 months after storage (Table 4). The texture score was least in Control(T_7) as compared to blanched broccoli. Blanched broccoli showed reduced rate of decrease of texture score during the period of storage. The texture score was maximum in hot water blanching 30 sec- T_1 (3.55) at end of storage period followed by steam blanched for 1min- T_3 (3.35) and hot water blanched 1min- T_2 (3.13)

Fig. 1. Rehydration of dried broccoli dried at 55^{0}C And 60^{0}C following different treatments.

Fig. 2. Difference in texture of rehydrated broccoli blanched in steam for 1 min, 5(3) and 2 minutes, 5(4).

So far as the different drying temperature were concerned, the effect was significant only on 3 and 4 months after storage. Texture evaluation revealed that the texture scores in broccoli dried at 60ºC (D_2) ranged from 4.79, 3.98 and 3.18 on 3, 4 and 5 months after storage respectively which were higher compared to broccoli dried at 55ºC(D_1).

The interaction between blanching methods and drying temperature was nonsignificant except on 4 months after storage. The highest interaction score was noted in broccoli steam blanched for 1min and dried at 60 ºC- T_3D_2 (3.67) at the end of storage, followed by hot water 30 sec, 60ºC (T_1D_2), hot water 30 sec and dried at 55ºC (T_1D_1), microwave blanch 30 sec and dried at 60º(T_4D_2) and so on in decreasing order while the least score was noted in control, 60ºC (T_7D_2) which decreased to score of 2.57 on the last month of storage

Best texture for drying at 55°C and 60°C was seen in hot water treatment for 30 seconds at the end of the storage period. The decreasing trend of texture among the dried broccoli during the storage may be due to the changes in pectic constituents, due to processing and storage conditions, and its effect on rehydration capacity of vegetables (Bestard *et al*., 2001; Kwolek and Bookwalter, 1971). The structure of dehydrated brinjal sample appeared totally broken with a consequent faster water uptake during rehydration (Russo *et al*., 2013).

Fig. 3. Dried broccoli (T_1) with hot water blanched 30 sec

Fig. 4. Dried broccoli (T_2) with hot water blanched 1min

Fig. 5. Dried broccoli(T_3) with steam blanched 1 min

Fig. 6. Dried broccoli (T_4) with steam blanched 2 min

Fig. 7. Dried broccoli (T_5) with microwave blanched 30 sec

Fig. 8. Dried broccoli with microwave blanched 1 min (T_6) and the control (T_7) from left to right

Overall acceptability

Table 5 presented the decreasing trend of overall acceptability of dried broccoli during the study of five months storage period. There was no significant effect of blanching treatments on overall acceptability score of dried broccoli during the month 1 and month3 which afterward became significant on month 4 and 5. Steam 1min blanching gave the highest score of overall acceptability (3.70) followed by hot water 30 sec blanching and hot water 30 sec and steam 2min blanched (3.68) which were at par with each other on the last month of storage.

Between the two drying temperatures, drying at 60ºC gave more acceptability score than drying at 55ºC

with significant effect on month 4 and 5 onwards.

The interaction between blanching methods and drying temperatures in respect of overall acceptability was significant month 4 onwards. With the progress in storage period, the overall acceptability score also decreased although the highest score was recorded in dried broccoli prepared by steam blanched for 1min, dried at 60ºC and followed by those blanched in steam for 2min, dried at 60ºC and microwave for 30 sec, dried at 60ºC even though the lowest score was noted in unblanched broccoli dried at 55ºC. Better overall acceptability was recorded in steam blanched broccoli and dried at 60ºC for the storage study of 5 months.

Drying of broccoli proves to be a better method for extending shelflife of this highly perishable crop. It would be hard to control the degradation of quality of dried broccoli during the storage period.Still, the best sensory score was obtained in steam blanched dried at temperature of 60ºCat the end of the 5 months' storage period. So steam blanching and drying at temperature 60ºC proved to maintain the best quality of dried broccoli among the other treatments during the 5 months storage period.

Authors' contribution

Conceptualization and designing of the research work (AKB), Execution of field/lab experiments and data collection (CC); Analysis of data and interpretation(CC); Preparation of manuscript (CC).

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