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Original Research Article

Drying of Spine Guard (*Momordica cochincinensis* L.)

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A B S T R A C T

The experiment entitled Drying of Spine Guard (*Momordica cochincinensis* L.) under Parbhani conditions was carried out during 2016-17 under the parbhani at Horticulture Department, V.N.M.K.V., Parbhani. During 2016-2017 with 18 treatment combination and two replication of spine gourd with a view to assess the physicochemical profile of spine gourds. The experiment was conducted on drying methods at different level compared with control in Factorial Randomized Block Design with two replications and 6 pre-treatments. During the investigation carried out on chemical pre-treatment, T_2 ($MgCo_3$-0.25%) dried under cabinet drying was found superior in maintaining minimum moisture, dehydration ratio, while maximum rehydration ratio, vitamin C, TSS, acidity, chlorophyll, sugar, iron thought the storage periods. However, the T_6 (control) treatment had registered the maximum moisture, dehydration ratio where as minimum rehydration ratio, vitamin C, TSS, acidity, chlorophyll, sugar, iron.

Keywords

7.7g carbohydrate, 3.1g protein, 3.1g fat, 3.0g fiber and 1.1g minerals

Introduction

Spine gourd, *Momardia cochinchinensis* L., also known as baby jackfruit or sweet gourd and gac fruit is one of the traditional fruits in Vietnam. This vegetable did not gain much popularity until it was discovered to have a high nutritional and medicinal value. The average nutritional value per 100g edible fruit was found to contain 84.1 per cent moisture, 7.7g carbohydrate, 3.1g protein, 3.1g fat, 3.0g fiber and 1.1g minerals. It also contained small quantities of essential vitamins like ascorbic acid, carotene, thiamin, riboflavin and niacin. It was concluded that this crop can be successfully cultivated in the plains and urban areas, as well as in countries where subtropical and tropical conditions prevail. This crop can provide additional nutrients and help the body develop natural immunity from many common ailments. Dried Spine gourd slice is usually the dried aril component having the high concentration of nutrients and colour (Aoki *et al.,* 2002; Ishida *et al.,* 2004).

Drying is the unique method for producing slice forms of fruits and vegetables. The main benefits of slice forms, as compared with fresh fruits and vegetables, are the potential for long storage at ambient temperature, and a significant reduction in the costs for transportation and storage. This is particularly important for seasonal fresh fruits such as spine gourd. Furthermore, the most important factor is that slice forms are very convenient food ingredients for use as flavors in food products (Tang and Yang, 2004).

Materials and Methods

The present investigation entitled "Drying of Spine Guard(*Momordica cochinchinesis* L.) was carried out in the Department of Horticulture, VNMKV, Parbhani)" with the object to assess the physicochemical profile of spine gourds. Rehydration ratio is calculated as Five gram of dehydrated sample was taken into a beaker and 50 ml of warm (60ºC) water was added into it. After one and half hour, the drained weight of the rehydrated material was taken (Singh and Sagar, 2013).The moisture content on the wet basis is given as, the initial mass (A) and the final mass (B) of the sample are recorded at an interval of every one hour till the end of drying using the balance (Venkatesan and Arjunan, 2014). Chlorophyll is extracted in 80 per cent acetone and absorbance at 663 nm and 645 nm are read in a spectrophotometer. Using absorbance coefficients, the amount of chlorophyll is calculated. Drying rate was computed by recording the loss in weight at half an hour interval and it was expressed as the rate of residual water to dry matter (Kg of water per kg of dry matter) (Singh and Sagar, 2013).The organoleptic was conducted in the post harvest technology and analytical Laboratory at University Department of Horticulture Post Graduate institute, Vasantrao Naik Marathwada Krishi Vidhyapeeth, Parbhani with a semi trained panal consisting of teachers post graduate students. Dehydrated spine gourd slices were evaluated for sensory qualities viz. colour, texture, flavor and overall acceptability. Each attribute was given a separate score of 9 points hedonic scale. Organoleptic panel consisted of 5 trained penelists evaluate the samples as per the hedonic scale described by (Rangana, 1979).

During *kharif*-2017 in Factorial Randomized Block Design with three replications. The data was recorded on five randomly selected samples for the characters viz.,Fruit colour, average weight of fruit, thickness of ring, diameter of ring, moisture, chlorophyll, acidity, TSS, sugar, iron and ascorbic acid were estimated as per the standard methods**.** The data obtained in respect of various observations were subjected to the statistical analysis (Factorial Randomized Block Design) as per the procedure given by (Panse and Sukhatme, 1985).

Results and Discussion

Various physicochemical parameters showed significant differences for various spine guard varieties.

Vitamin C

The results on the loss of ascorbic acid content during dehydration revealed that the changes in ascorbic content in dried spine gourd slices vary significantly due to different pretreatments are presented in Table 1 and depicted in Loss of ascorbic acid primarily due to its oxidation during dehydration. The better retention of ascorbic acid was observed significantly higher treatment M_3T_2 ($MgCo_3$ - 0.25% + cabinet drying) followed by M_3T_3 (Nacl - 2% + cabinet drying) and hence ascorbic acid retention was better in $MgCo_3$. The loss of ascorbic acid higher in the sun drier as compare to solar and cabinet drying. The maximum loss of ascorbic acid content observed in control sample.

These results are in good agreement with the result reported by (Dhotre *et al.,* 2013) and (Singh and Sagar. 2013).

TSS

The results on the loss of TSS content during dehydration revealed that the changes in

sugar content in dried spine gourd slices vary significantly due to different pretreatments are presented in Table 2. Loss of TSS primarily due to its oxidation during dehydration. The better retention of TSS was observed significantly higher treatment M_3T_2 ($MgCo_3$ - 0.25% + cabinet drying) followed by M_3T_3 (Nacl-2% + cabinet drying) and hence TSS retention was better in $MgCo_3$. The maximum loss of TSS content observed in control sample.

These results are in good agreement with the result reported by (Dhotre *et al.,* 2013) and (Singh and Sagar.2013).

Iron

In the present study, the iron content was significantly affected not only by the pre-treatment, drying methods, but also by the storage periods are presented in Table 3. The better retention of iron content was observed significantly higher in treatment combination M_1T_2 (sun drying + $MgCo_3$-0.25%). Better retention of iron in sun dried sample compare to solar and cabinet drying.

Similar results reported by (Venkatesan, Arjunan. 2014) and (Umayal Sundari. 2013).

Moisture (%)

It was observed from the data that moisture content in dried spine gourd slices increased with advancement of storage upto 90 days are presented in Table 4. The gain of moisture was highest in control as compare to treatment combination M_3T_5 (blanching with Nacl 2% + cabinet drying).The progressive increase in moisture content was notified in all the samples dried by cabinet, solar and sun drying method. It is might be due to hygroscopic nature of the slices, which absorbed the moisture during storage. Cabinet drying recorded minimum moisture content as compare to solar and sun drying it is might be due to high temp and constant air flow and minimum time required for drying of spine gourd slices.

Similar kinds of observation were also recorded by (Singh *et al.,* 2009), (Srinivasan and Balusamy. 2015) and (Venkatesan and Arjunan. 2014).

Acidity (%)

It was observed from the data that acidity content in dried spine gourd slices increased with advancement of storage up to 90 days are presented in Table 5.At the stage of immediately after drying, significantly the highest (0.93 per cent) acidity was estimated when spine gourd slices was without pretreatment. Further, the lowest was noticed in the 0.25% $MgCo_3$. At 30, 60 and 90 days of storage, acidity was significantly differed and same trend to that of immediately after drying was noticed. However, the lowest acidity (0.39%) was noticed in the pre treatment T_2 i.e. 0.25% $MgCo_3$.

Similar result was recorded in (Dhotre *et al.,* 2012).

Chlorophyll

It was observed from the data that chlorophyll content in dried spine gourd slices increased with advancement of storage up to 90 days are presented in Table 6.

At the stage of immediately after drying, significantly the highest (24.11 mg/100g) chlorophyll was estimated when spine gourd slices was treated with M_1T_2 (sun drying + $MgCo_3$) pretreatment. Further, the lowest was noticed in the M_1T_6 (sun drying + control). At 30, 60 and 90 days of storage, chlorophyll was significantly differed and same trend to that of immediately after drying was noticed.

Table.1 Effect of storage periods on vitamin C content of dried spine gourd slices

Treatment	Vitamin C mg/100g															
	Storage periods															
	0				30				60				90			
	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean
T_1 (Blanching)	24.95	32.77	44.09	**33.93**	24.44	32.34	43.63	**33.47**	23.87	32.31	43.09	**33.09**	23.74	31.14	42.80	**32.56**
T_2 (0.25% MgCo3)	31.15	41.86	61.78	**44.93**	30.97	40.99	61.52	**44.49**	30.26	40.47	61.11	**43.94**	28.96	35.13	55.69	**39.92**
T_3 (2% Nacl)	30.27	35.52	53.13	**39.64**	28.94	35.40	52.61	**38.98**	27.16	34.92	51.59	**37.89**	24.83	32.57	51.04	**36.14**
T_4 (Blanching +0.25% $MgCo_3$)	29.23	34.32	51.44	**38.33**	25.82	34.04	51.05	**36.97**	25.63	33.46	48.98	**36.02**	24.55	32.56	47.10	**34.73**
T_5 (Blanching +2% Nacl)	25.47	33.08	49.54	**36.03**	25.38	33.01	49.49	**35.96**	24.15	32.83	48.88	**35.28**	23.75	31.94	44.36	**33.35**
T_6 (control)	23.97	30.67	41.27	**31.97**	23.67	30.26	40.56	**31.49**	22.03	30.05	40.36	**30.81**	20.87	29.99	40.00	**30.28**
Mean	**27.50**	**34.70**	**50.20**		**26.53**	**34.34**	**49.81**		**25.51**	**34.00**	**49.00**		**24.45**	**32.22**	**46.83**	
SE ± (T)	0.46				0.46				0.46				0.40			
CD at 5%	1.38				1.37				1.37				1.20			
SE ± (M)	0.32				0.32				0.32				0.28			
CD at 5%	0.97				0.97				0.97				0.85			
SE ± (M x T)	0.80				0.80				0.79				0.69			
CD at 5%	2.39				2.38				2.38				2.08			

Table.2 Effect of storage periods on TSS content of dried spine gourd slices

Treatment	TSS															
	Storage periods															
	0				30				60				90			
	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean
T_1 (Blanching)	3.68	4.17	4.68	**4.17**	3.89	4.34	4.74	**4.32**	3.99	4.43	4.85	**4.42**	4.11	4.55	4.96	**4.54**
T_2 (0.25% MgCo3)	4.11	5.24	5.61	**4.98**	4.44	5.37	5.78	**5.19**	4.53	5.49	5.87	**5.29**	4.56	5.57	5.98	**5.37**
T_3 (2% NaCl)	3.79	4.49	5.15	**4.47**	3.90	4.55	5.23	**4.56**	4.03	4.67	5.31	**4.67**	4.16	4.77	5.45	**4.79**
T_4 (Blanching + 0.25% $MgCo_3$)	3.63	4.06	4.60	**4.09**	3.79	4.09	4.72	**4.20**	3.9	4.21	4.83	**4.31**	4.01	4.34	4.94	**4.43**
T_5 (Blanching + 2% NaCl)	3.36	3.74	4.26	**3.78**	3.46	3.83	4.32	**3.87**	3.55	3.96	4.43	**3.98**	3.67	4.06	4.55	**4.09**
T_6 (control)	3.18	3.49	3.83	**3.50**	3.36	3.59	3.91	**3.62**	3.48	3.66	4.01	**3.71**	3.61	3.80	4.13	**3.84**
Mean	**3.62**	**4.19**	**4.68**		**3.80**	**4.29**	**4.78**		**3.19**	**4.40**	**4.75**		**4.02**	**4.51**	**5.00**	
SE ± (T)	0.05				0.08				0.09				0.08			
CD at 5%	0.16				0.25				0.27				0.23			
SE ± (M)	0.03				0.06				0.06				0.05			
CD at 5%	0.11				0.18				0.19				0.16			
SE ± (M x T)	0.09				0.14				0.16				0.13			
CD at 5%	0.28				0.44				0.48				0.41			

Table.3 Effect of storage periods on iron content of dried spine gourd slices

Treatment	Iron mg/100g															
	Storage periods															
	0				30				60				90			
	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean
T_1 (Blanching)	6.29	5.30	4.33	**5.30**	6.26	5.28	4.25	**5.26**	6.20	5.23	4.18	**5.30**	6.14	5.21	4.13	**5.16**
T_2 (0.25% MgCo3)	6.66	5.85	5.13	**5.88**	6.66	5.86	5.10	**5.87**	6.60	5.81	4.94	**5.78**	6.56	5.74	4.91	**5.73**
T_3 (2% NaCl)	6.61	5.73	4.89	**5.74**	6.60	5.75	4.84	**5.73**	6.50	5.69	4.81	**5.66**	6.46	5.64	4.76	**5.62**
T_4 (Blanching + 0.25% $MgCo_3$)	6.44	5.45	4.64	**5.51**	6.44	5.42	4.65	**5.50**	6.37	5.36	4.50	**5.41**	6.30	5.31	4.54	**5.38**
T_5 (Blanching + 2% NaCl)	6.32	5.33	4.19	**5.28**	6.31	5.32	4.28	**5.30**	6.24	5.25	4.25	**5.24**	6.20	5.28	4.21	**5.23**
T_6 (control)	6.14	5.20	4.14	**5.16**	6.13	5.13	4.07	**5.11**	6.05	5.10	4.05	**5.06**	6.00	5.07	4.01	**5.02**
Mean	**6.41**	**5.47**	**4.55**		**6.40**	**5.46**	**4.53**		**6.32**	**5.4**	**4.45**		**6.27**	**5.37**	**4.42**	
SE ± (T)	0.03				0.03				0.04				0.04			
CD at 5%	0.11				0.11				0.12				0.12			
SE ± (M)	0.02				0.02				0.02				0.03			
CD at 5%	0.08				0.08				0.08				0.09			
SE ± (M x T)	0.06				0.06				0.06				0.07			
CD at 5%	0.20				0.20				0.20				0.22			

Table.4 Effect of storage periods on moisture content of dried spine gourd slices

Treatment	Moisture%															
	Storage periods															
	0				30				60				90			
	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean
T_1 (Blanching)	8.56	7.54	6.10	**7.40**	8.58	7.58	6.13	**7.43**	8.59	7.63	6.20	**7.47**	8.65	7.67	6.20	**7.50**
T_2 (0.25% MgCo3)	9.05	8.02	6.82	**7.96**	9.13	8.05	6.76	**7.98**	9.22	8.09	6.89	**8.06**	9.27	8.16	6.91	**8.11**
T_3 (2% NaCl)	7.85	7.65	6.54	**7.34**	7.90	7.67	6.56	**7.37**	8.85	7.70	6.62	**7.72**	7.93	7.75	6.68	**7.45**
T_4 (Blanching + 0.25% $MgCo_3$)	8.32	6.59	5.62	**6.84**	8.36	6.64	5.65	**6.88**	8.41	6.67	5.67	**6.91**	8.46	6.77	5.74	**6.99**
T_5 (Blanching + 2% NaCl)	7.32	6.13	5.47	**6.30**	7.32	6.14	5.52	**6.32**	7.33	6.22	5.54	**6.37**	7.39	6.21	5.63	**6.41**
T_6 (control)	9.57	8.20	7.23	**8.36**	9.70	8.26	7.27	**8.41**	9.76	8.27	7.32	**8.45**	9.80	8.32	7.34	**8.48**
Mean	**8.46**	**7.35**	**6.29**		**8.49**	**7.39**	**6.31**		**8.69**	**7.43**	**6.37**		**8.58**	**7.48**	**6.41**	
SE ± (T)	0.10				0.12				0.09				0.08			
CD at 5%	0.32				0.37				0.28				0.25			
SE ± (M)	0.07				0.08				0.06				0.05			
CD at 5%	0.22				0.26				0.20				0.17			
SE ± (M x T)	0.18				0.21				0.16				0.14			
CD at 5%	0.55				0.64				0.49				0.43			

Table.5 Effect of storage periods on acidity content of dried spine gourd slices

Treatment	Acidity															
	Storage periods															
	0				30				60				90			
	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean
T_1 (Blanching)	0.88	0.75	0.63	**0.75**	1.04	0.83	0.7	**0.85**	1.08	0.89	0.76	**0.91**	1.17	0.96	0.76	**0.96**
T_2 (0.25% MgCo3)	0.53	0.37	0.27	**0.39**	0.57	0.45	0.35	**0.45**	0.64	0.5	0.43	**0.52**	0.69	0.54	0.48	**0.57**
T_3 (2% NaCl)	0.72	0.68	0.61	**0.67**	0.76	0.72	0.66	**0.71**	0.85	0.79	0.74	**0.79**	0.94	0.81	0.72	**0.82**
T_4 (Blanching + 0.25% $MgCo_3$)	0.56	0.4	0.33	**0.43**	0.61	0.46	0.37	**0.48**	0.66	0.54	0.45	**0.55**	0.73	0.66	0.55	**0.64**
T_5 (Blanching + 2% NaCl)	0.76	0.65	0.6	**0.67**	0.9	0.76	0.61	**0.75**	0.94	0.81	0.69	**0.81**	1.04	0.92	0.75	**0.9**
T_6 (control)	1.00	0.94	0.86	**0.93**	1.15	1.05	0.92	**1.04**	1.21	1.16	0.99	**1.12**	1.27	1.21	1.12	**1.2**
Mean	**0.74**	**0.63**	**0.55**		**0.83**	**0.71**	**0.6**		**0.89**	**0.78**	**0.67**		**0.97**	**0.85**	**0.73**	
SE ± (T)	0.006				0.016				0.007				0.010			
CD at 5%	0.019				0.049				0.021				0.031			
SE ± (M)	0.004				0.011				0.005				0.007			
CD at 5%	0.013				0.035				0.015				0.022			
SE ± (M x T)	0.011				0.028				0.012				0.018			
CD at 5%	0.033				0.086				0.037				0.054			

Table.6 Effect of storage periods on chlorophyll content of dried spine gourd slices

Treatment	Chlorophyll (mg/100g)															
	Storage periods															
	0				30				60				90			
	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean
T_1(Blanching)	18.75	18.74	18.87	**18.78**	18.13	18.42	18.75	**18.43**	17.76	17.90	18.49	**18.05**	17.41	17.63	18.04	**17.69**
T_2 (0.25% MgCo3)	24.12	24.28	23.95	**24.11**	23.31	23.41	23.80	**23.50**	23.06	23.21	23.54	**23.27**	22.91	23.05	23.26	**23.07**
T_3 (2% NaCl)	22.43	22.52	23.16	**22.70**	21.56	22.03	23.13	**22.24**	21.36	21.75	22.59	**21.90**	21.16	21.52	22.33	**21.67**
T_4 (Blanching +0.25% $MgCo_3$)	19.49	19.56	20.34	**19.79**	19.05	19.83	20.29	**19.72**	18.87	19.73	20.65	**19.75**	18.64	19.72	20.13	**19.49**
T_5 (Blanching +2% NaCl)	20.10	20.93	21.80	**20.94**	19.23	20.57	21.78	**20.52**	18.98	19.67	20.93	**19.86**	18.49	19.19	20.25	**19.31**
T_6 (control)	17.62	17.82	18.10	**17.84**	16.81	17.27	18.03	**17.37**	16.14	17.61	17.84	**17.19**	15.45	16.25	17.51	**16.40**
Mean	**20.41**	**20.64**	**21.03**		**19.68**	**20.25**	**20.96**		**19.36**	**19.97**	**20.67**		**19.01**	**19.56**	**20.25**	
SE ± (T)	0.14				0.04				0.11				0.21			
C(D at 5%	0.43				0.14				0.33				0.64			
SE ± (M)	0.10				0.03				0.07				0.15			
CD at 5%	0.30				0.10				0.23				0.45			
SE ± (M x T)	0.25				0.08				0.19				0.37			
CD at 5%	0.75				0.24				0.57				1.11			

Table.7 Effect pre-treatment and drying methods on drying rate of dried spine gourd slices

	Drying Rate			
Treatment	**M_1**	**M_3**	**M_2**	**Mean**
T_1 (Blanching)	0.7	1.2	1.3	**1.0**
T_2 (0.25% MgCo3)	0.7	1.4	1.5	**1.2**
T_3 (2% NaCl)	0.7	1.3	1.4	**1.1**
T_4 (Blanching + 0.25% $MgCo_3$)	0.6	1.2	1.3	**1.0**
T_5 (Blanching + 2% NaCl)	0.6	0.8	1.0	**0.8**
T_6 (control)	0.8	1.5	1.6	**1.3**
Mean	**0.6**	**1.2**	**1.4**	
F test	**Sig**	**Sig**	**Sig**	
SE ± (T)	0.07			
CD at 5%	0.43			
SE ± (M)	0.05			
CD at 5%	0.14			
SE ± (M x T)	0.13			
CD at 5 %	0.39			

Table.8 Effect of pre-treatment and drying methods on rehydration ratio of dried spine gourd slices

	Rehydration Ratio			
Treatment	**M_1**	**M_3**	**M_2**	**Mean**
T_1 (Blanching)	5.18	5.73	6.52	**5.81**
T_2 (0.25% MgCo3)	5.36	5.88	6.55	**5.93**
T_3 (2% NaCl)	5.62	5.97	6.74	**6.11**
T_4 (Blanching + 0.25% $MgCo_3$)	4.68	5.09	6.24	**5.33**
T_5 (Blanching + 2% NaCl)	4.78	5.41	6.39	**5.52**
T_6 (control)	4.38	4.46	6.08	**4.97**
Mean	**5.00**	**5.42**	**6.42**	
F test	**Sig**	**Sig**	**Sig**	
SE ± (T)	0.07			
CD at 5%	0.22			
SE ± (M)	0.05			
CD at 5%	0.16			
SE ± (M x T)	0.13			
CD at 5 %	0.39			

However, the lowest chlorophyll (15.45 mg/100g) was noticed in the pre treatment T_6 i.e. control. Similar result was recorded in (Dhotre *et al*., 2012). Also the same result was reported in (Singh *et al*., 2013).

Effect of drying methods on drying time

There were significant differences between the drying methods irrespective of pre-treatment. (Cabinet drying) M_3 required minimum time 5.04 hrs as compared to (solar drying) M_2 12.65 hrs and (sun drying) M_1 17.65 hrs for drying of spine gourd slices.

The interaction effect between the pre-treatment and drying methods were found statistically significant. The treatment combination M_1T_2 (sun drying x $MgCo_3$) recorded maximum (18.76 hrs) time for drying which was found statistically at par with the treatment combination M_1T_3 (sun drying x Nacl 2%) (18.44 hrs), while the treatment combination M_3T_6 (cabinet drying x control) recorded minimum (4.47 hrs) drying time. Similarly M_3T_2 (cabinet drying x $MgCo_3$) (5.56) was found statistically significant. Where as in solar drying treatment combination M_2T_2 (solar drying x $MgCo_3$) (14.45 hrs) was found statistically significant.

Effect of pre-treatment on rehydration ratio

The effect of different pre-treatment on rehydration ratio of dried spine gourd slices was recorded and found significant differences between pre-treatment and drying methods. Significantly highest rehydration ratio rehydration ratio was recorded in pre-treatment T_3 - (Nacl 2%) (6.11) and lowest in T_6 - untreated (control) (4.97), pre-treatment T_3 - (Nacl 2%) (6.11) was found significantly at par with the pre-treatment T_2 - ($MgCo_3$ - 0.25%) (5.93).

From the present findings following conclusions can be drawn. The maximum vitamin C, TSS, acidity, chlorophyll, sugar, iron and rehydration ratio were recorded in the dehydrated slices treated with $MgCo_3$ - 0.25% pretreatment dried under cabinet drier and minimum in control (T_6) pretreatment dried under sun. However maximum moisture, dehydration ratio were registered in control (T_6) pre-treatment dried under sun while minimum in T_3 - Nacl - 2% pre-treatment dried in cabinet drier with advancement of storage periods. During storage, the physiochemical parameters like moisture were showed the increasing trend while vitamin C, TSS, acidity, chlorophyll, sugar and iron content were noticed the decreasing trend with the advancement of storage period.

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