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Original Research Article

Studies on Physicochemical Profile of Spine Guard (*Momordica cochincinensis* L.)

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A B S T R A C T

The experiment entitled studies on physicochemical profile 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-treatment. 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).

Materials and Methods

The present investigation entitled the study on studies on physicochemical profile 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. The study involved one genetically diverse with three drying methods

viz. 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 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**.**

Results and Discussion

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

physicochemical parameters

Fruit colour, average weight of fruit, thickness of ring, diameter of ring, moisture, chlorophyll, acidity, TSS, sugar, iron and ascorbic acid all these parameters showed significant difference among various cultivars.

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.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. This is might be due to the proportional of moisture content and dry matter in the finished product, which might have affected the ascorbic acid in different drying condition Ascorbic acid is very sensitive to heat it might be lost due to application of heat during 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 loss of TSS higher in the sun drier as compare to solar and cabinet drying. This is might be due to the proportional of moisture content and dry matter in the finished product, which might have affected the TSS in different drying condition TSS is very sensitive to heat it might be lost due to application of heat during drying. 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).

Table.1 Fruit colour, average weight of fruit, thickness of ring, diameter of ring, moisture, chlorophyll, acidity, TSS, sugar, iron and ascorbic acid all these parameters showed significant difference among various cultivars

Sr. No.	Physical Characteristics	Observations
1	Fruit colour	Dark green
2	Av. weight of whole fruit	23.6 gm
3	Thickness of ring	5.3 cm
4	Diameter of ring	2.4 cm
5	Moisture	84.1 %
6	Iron	5.0 mg/100g
7	TSS	4.33
8	Acidity	0.74%
9	Vitamin C	36.25 mg/100g
10	Sugar	3.55 mg/100g
11	Chlorophyll	20.14 mg/100g

Table.2 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.3 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.4 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.5 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.6 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.7 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			

Iron

The iron is the main chemical component of the vegetables. It was determined in the dehydrated spine gourd slices at different stages of storage. 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 pre-treatment have showed distinct effect on the retention of iron content, while pre-treatment of $MgCo_3$ and Nacl have helped to maintain higher iron level than control. The iron content was also affected by the storage period with advancement in the storage up to 90 days of storage, there was gradual decrease in the iron content in drying methods irrespective of pretreatment during storage it was observed that significantly highest iron content was recorded in cabinet drying as compare to solar and sun dried sample. 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 up to 90 days are presented in Table 4.The increasing trend might be due to gain of moisture by the dried slices from the atmosphere. 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 upto 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. 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).

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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