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Influence of Pre-Treatments and Drying Methods on Physico-Chemical Characteristics of Green Chilli Powder

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ABSTRACT

The present experiment entitled Influence of pre-treatments and drying methods on the physico-chemical characteristics of green chilli powder was conducted at Post Harvest Technology Laboratory, College of Horticulture, Venkataramannagudem, West Godavari district. The experiment was laid out in factorial CRD and replicated thrice. The pre-treatments used in the experiment were blanching, blanching with 0.01% KMS, blanching with 1% $CaCl_2$ and blanching + 1% ascorbic acid. The varieties used were CA-960 and LCA-655 dried by using tray drying and sun drying. Among the treatment combinations, the green chilli powder prepared from the varietyCA-960 pre-treated with blanching with 1% $CaCl_2$ and dried using the tray drier is having less titratable acidity, more total sugars whereas the highest recovery percentage was observed in the variety LCA-655 pre-treated blanching with 1% $CaCl_2$ and dried by using tray drier.

Key words: *Pre-treatments, Titratable acidity, Total sugars, Recovery.*

INTRODUCTION

Green chilli (*Capsicum annum* L.) is an important commercial vegetable crop belonging to the family solanaceae. Green chillies are known for their sharp acidic flavour. It is a rich source of antioxidants and vitamins. A huge amount of green chillies were found to be wasted due to lack of proper preservation techniques[6]. Dehydration is the best method to reduce the post harvest losses and to add value to the green chillies. Pre-treating the green chillies before the dehydration is to improve the quality and reduce the drying time. Sometimes cost of green chillies rise is very high, and chilli powder which is prepared during glut period can be used as a substitute. Green chilli powder has practical applications for use with many food adjuncts in place of fresh green chillies. It is important in soup and sauce preparation.

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The powder can be used for sprinkling on products such as potato wafers, chips, finger fries, extruded products, sandwiches, pizzas, burgers etc. Green chilli powder can be used for making various chutney powders, which are major adjuncts in Asian and African diets. Moreover, the increasing demand of processed ready- to-cook (RTC) and ready-to-eat (RTE) products has resulted in increasing use of dried vegetable in convenience foods. Hence, the present study was conducted to evaluate the influence of pre-treatments and drying methods on physico-chemical characteristics of green chilli powder prepared from different varieties.

MATERIAL AND METHODS

The experiment was laid out in factorial CRD with unequal levels. Four pre-treatments *i.e.*, blanching, blanching + 0.01% KMS, blanching + 1% $CaCl_2$, blanching + 1% ascorbic acid, two varieties (CA-960, LCA-960) two drying methods (tray and sun drying), were used in the experiment. The green chillies used in the experiment were harvested at mature green stage. After harvesting chillies were subjected to washing and blanching, after removal of stems. The green chillies were blanched for 2 minutes at 85-90^{0}C. After blanching chillies were soaked in pre-treatment solutions i.e 0.01% KMS, 1% $CaCl_2$, 1% ascorbic acid. for 10 minutes and dried them in tray drier and under the sun upto a desired moisture level (10-12%). The chillies were given longitudinal cuts inorder to absorb the pre-treatment solutions after blanching. The green chilli powder was estimated for titratable acidity (%),Total sugars (%), recovery (%). Recovery percentage was estimated by calculating the weight of raw product and net product after drying the product to desirable moisture content. Titratable acidity was analysed by titrating a known aliquot of sample against standard 0.1 N NaOH using phenolphthalein as indicator. Total sugars were determined by the method of Lane and Eynon[3].

RESULTS AND DISCUSSION

Effect of pre-treatment, variety and drying method and their interactions was found significant on recovery percentage. The mean recovery percentage of green chilli powder is 13.9% (Table1). Among the pre-treatments highest recovery percentage was recorded in blanching + 1% $CaCl_2$ (14.8%). Among the varieties, the highest recovery percentage was noticed in LCA 655 (16.0%).The sun drying method resulted in highest recovery percentage (14.3%). Calcium helps to maintain the structural integrity of cell walls and membranes. Calcium binds to the cell wall cross lines particularly with pectin components of middle lamella. In view of the above discussion calcium pre-treated samples could maintain better recovery as compared to control[2]. More recovery percentage was obtained from sun dried powder as compared to tray dried powder[5].The mean titratable acidity percentage over the different treatment combinations was steadily increased from (4.26%) on the initial day of processing to (4.47%) at 60 days after processing (Table.2). At 60 days after processing, the pre-treatment blanching + 1% $CaCl_2$ recorded the lowest acidity (4.04%) where as the highest acidity was recorded in the blanching + 1% ascorbic acid (4.86%). Among the varieties, the lowest acidity (3.32%) was recorded in CA-960. The tray drying method resulted in lower acidity content (4.34%). The results are in agreement with the findings of Ghavidel and Davoodi[1]. Increase in acidity may be due to partial fermentation, longer time consumption of pectic enzyme activity in first few hours of the drying process. Highest acidity percentage was observed in the ascorbic acid treated samples which might be perhaps due to acidic nature of the ascorbic acid. The acidity percentage was higher in the sun dried chilli powder which might be due to the variations caused by contamination from microorganisms especially lactic acid bacteria. On account of organic acid production by these bacteria, the titratable acidity could have increased in those treatment combinations vulnerable for contamination due to the bacteria[4]. The changes in the acidity during storage might be due to the reaction of basic amines to form compounds of lower basicity and degradation of sugars into acids

during millard reaction. The mean total sugars percentage was steadily decreased from 5.70% on the initial day of processing to 4.86% at 60 days after processing (Table3). At 60 days after processing, the pre-treatment blanching + 1% $CaCl_2$ recorded the highest total sugars (5.62%) which was followed by blanching + 0.01% KMS (4.99%) and lowest value (4.22%) was recorded in the blanching. Among the varieties, the highest total sugars percentage (5.98%) was noticed in CA-960 at 60 days after processing, as compared to LCA 655(3.74 %).The tray drying method resulted in higher (5.30%) retention of total sugars as compared to sun drying (4.42%) at 60 DAP.A similar result was recorded by the Ghavidel and Davoodi[1]. Changes in total sugar content during storage might be related to the non enzymatic reaction. It is believed that calcium is capable of forming chelated compounds with organic substances having an alpha amino carboxylic acid moiety. Under these circumstances, it would be reasonable to expect that calcium treatment may be applicable to control non enzymatic browning which is conformed in the present study. It was finally concluded that green chilli powder prepared from the variety LCA-655, pre-treated with blanching +1% $CaCl_2$ and dried by using tray drier recorded the highest recovery percentage. Whereas, the least titratable acidity and highest total sugars were observed in the variety CA 960 treated with blanching +1% $CaCl_2$ and dried by using tray drier.

Table 1: Effect of pre- treatments, varieties and drying methods on recovery (%) of green chilli powder

	DRYING METHOD (D)	PRE-TREATMENT (P)				
		BLANCHING ONLY	BLANCHING + 0.01% KMS	BLANCHING +1% $CaCl_2$	BLANCHING + 1% ASC. ACID	**MEAN**
	TRAY DRYING	11.2	11.7	12.0	11.5	**11.6**
	SUN DRYING	11.6	12.2	13.1	11.8	**12.2**
	MEAN	**11.4**	**12.0**	**12.6**	**11.7**	***11.9***
	TRAY DRYING	14.9	15.8	16.3	15.2	**15.6**
	SUN DRYING	15.7	16.5	17.6	15.9	**16.4**
	MEAN	**15.3**	**16.2**	**17.0**	**15.6**	***16.0***
For comparing pre-treatment (P) and drying method (D)						
	TRAY DRYING	13.1	13.8	14.2	13.4	***13.6***
	SUN DRYING	13.7	14.4	15.4	13.9	***14.3***
	MEAN	***13.4***	***14.1***	***14.8***	***13.6***	***13.9***

Comparing means of	S Em±	CD at 0.05%
P	0.10	0.31
V	0.33	0.95
D	0.33	0.95
P x V	0.41	1.19
V x D	0.63	1.81
P x D	-	N.S
P x V x D	0.73	2.01

Table 2: Effect of pre-treatments, varieties and drying methods on titratable acidity (%) in green chilli powder

VARIETY (V)	DRYING METHOD (D)	PRE-TREATMENT (P)														
		Initial					30 DAP					60 DAP				
		BLANCHING ONLY	BLANCHING + 0.01% KMS	BLANCHING +1% $CaCl_2$	BLANCHING + 1% ASC. ACID	**MEAN**	BLANCHING ONLY	BLANCHING + 0.01% KMS	BLANCHING +1% $CaCl_2$	BLANCHING + 1% ASC. ACID	**MEAN**	BLANCHING ONLY	BLANCHING + 0.01% KMS	BLANCHING +1% $CaCl_2$	BLANCHING + 1% ASC. ACID	**MEAN**
CA-960	TRAY DRYING	2.88	3.06	2.69	3.22	**2.96**	2.98	3.13	2.74	3.33	**3.05**	3.14	3.26	2.85	3.51	**3.19**
	SUN DRYING	3.12	3.23	2.86	3.58	**3.20**	3.25	3.34	2.96	3.69	**3.31**	3.42	3.50	3.11	3.78	**3.45**
	MEAN	**3.00**	**3.15**	**2.78**	**3.40**	***3.08***	**3.12**	**3.24**	**2.85**	**3.51**	***3.18***	**3.28**	**3.38**	**2.98**	**3.65**	***3.32***
LCA-655	TRAY DRYING	5.24	5.49	4.86	5.70	**5.32**	5.34	5.57	4.92	5.82	**5.41**	5.42	5.65	4.98	5.93	**5.50**
	SUN DRYING	5.53	5.72	5.08	5.97	**5.58**	5.62	5.78	5.15	6.09	**5.66**	5.71	5.86	5.22	6.21	**5.75**
	MEAN	**5.39**	**5.61**	**4.97**	**5.84**	***5.45***	**5.48**	**5.68**	**5.04**	**5.96**	***5.44***	**5.57**	**5.76**	**5.10**	**6.07**	***5.62***
For comparing pre-treatment (P) and drying method (D)																
TRAY DRYING		4.06	4.28	3.78	4.46	***4.14***	4.16	4.35	3.83	4.58	***4.23***	4.28	4.46	3.92	4.72	***4.34***
SUN DRYING		4.33	4.48	3.97	4.78	***4.39***	4.44	4.56	4.06	4.89	***4.49***	4.57	4.68	4.17	5.00	***4.60***
MEAN		***4.19***	***4.38***	***3.87***	***4.62***	***4.26***	***4.30***	***4.46***	***3.94***	***4.73***	***4.36***	***4.42***	***4.57***	***4.04***	***4.86***	***4.47***

Comparing means of	S Em±	CD at 0.05%	S Em±	CD at 0.05%	S Em±	CD at 0.05%
P	0.07	0.19	0.05	0.14	0.04	0.10
V	0.42	1.18	0.31	0.88	0.22	0.63
D	0.42	1.18	0.31	0.88	0.22	0.63
P x V	0.40	1.14	0.17	0.48	0.12	0.35
V x D	0.79	2.25	0.58	1.66	0.42	1.20
P x D	-	N.S	-	N.S	-	N.S
P x V x D	-	N.S	0.63	1.80	-	N.S

Table 3: Effect of pre-treatments, varieties and drying methods on total sugar (%) in green chilli powder

VARIETY (V)	DRYING METHOD (D)	PRE-TREATMENT (P)														
		Initial					30 DAP					60 DAP				
		BLANCHING ONLY	BLANCHING + 0.01% KMS	BLANCHING +1% $CaCl_2$	BLANCHING + 1% ASC. ACID	**MEAN**	BLANCHING ONLY	BLANCHING + 0.01% KMS	BLANCHING +1% $CaCl_2$	BLANCHING + 1% ASC. ACID	**MEAN**	BLANCHING ONLY	BLANCHING + 0.01% KMS	BLANCHING +1% $CaCl_2$	BLANCHING + 1% ASC. ACID	**MEAN**
CA-960	TRAY DRYING	7.06	7.92	8.22	7.40	**7.65**	6.25	7.30	7.73	6.70	**7.00**	5.65	6.77	7.30	6.13	**6.46**
	SUN DRYING	5.90	6.84	7.38	6.31	**6.61**	5.24	6.25	6.84	5.70	**6.01**	4.74	5.60	6.37	5.24	**5.49**
	MEAN	**6.48**	**7.38**	**7.80**	**6.86**	***7.13***	**5.75**	**6.78**	**7.29**	**6.20**	***6.50***	**5.20**	**6.19**	**6.84**	**5.69**	***5.98***
LCA-655	TRAY DRYING	4.24	4.85	5.28	4.64	**4.75**	3.89	4.54	5.04	4.27	**4.44**	3.61	4.27	4.71	3.96	**4.14**
	SUN DRYING	3.25	3.84	4.57	3.57	**3.81**	3.06	3.60	4.33	3.36	**3.59**	2.86	3.30	4.08	3.13	**3.34**
	MEAN	**3.75**	**4.35**	**4.93**	**4.11**	***4.28***	**3.48**	**4.07**	**4.69**	**3.82**	***4.01***	**3.24**	**3.79**	**4.40**	**3.55**	***3.74***
For comparing pre-treatment (P) and drying method (D)																
TRAY DRYING		5.65	6.39	6.75	6.02	***6.20***	5.07	5.92	6.39	5.49	***5.72***	4.63	5.52	6.01	5.05	***5.30***
SUN DRYING		4.58	5.34	5.98	4.94	***5.21***	4.15	4.93	5.59	4.53	***4.80***	3.80	4.45	5.23	4.19	***4.42***
MEAN		***5.11***	***5.86***	***6.36***	***5.48***	***5.70***	***4.61***	***5.42***	***5.99***	***5.01***	***5.26***	***4.22***	***4.99***	***5.62***	***4.62***	***4.86***

Comparing means of	S Em±	CD at 0.05%	S Em±	CD at 0.05%	S Em±	CD at 0.0 5%
P	0.07	0.21	0.06	0.17	0.04	0.12
V	0.50	1.43	0.37	1.05	0.27	0.76
D	0.50	1.43	0.37	1.05	0.27	0.76
P x V	0.48	1.36	0.17	0.48	0.12	0.35
V x D	0.95	2.71	0.70	1.99	0.50	1.44
P x D	0.48	1.36	-	N.S	0.12	0.35
P x V x D	-	N.S	-	N.S	-	N.S

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