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Impact of pretreatments and method of drying on quality and recovery percent of red chilli cultivars

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ABSTRACT
Chilli (Capsicum annum L.) has significant price fluctuation. When the chilli price is declined, it causes food waste from unsold chilli. Therefore, drying chilli is a solution for this condition. Drying methods and pre-treatments for producing good quality dried chilli power were optimized. The quality of dried red chilli powder in terms of colour and chemical parameters was studied on two different varieties of chilli. Three blanching method hot water, sodium chloride (2%) solutions and gum acacia (0.2%) and four drying methods solar drying, hot air oven drying, shade drying and were tried for the powder of chilli. Out of various drying methods and pre-treatments the best chilli powder was obtained in blanching and then soaked in gum acacia solution in hot air oven drying. The maximum recovery percent of (22.20%) was obtained in solar drying while it was minimum in (17.17%) in open sun drying. Similarly colour value was higher in solar drying and pretreatment samples as compare to control.
Keywords: *Blanching, drying, pretreatment, gum acacia*

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INTRODUCTION

Chilli, specially (*Capsicum annum* L.) is a general name for plants coming from Capsicum species of Solanaceae family, whose products are used as vegetables and spices. Chilli is a good source of vitamin A and C, which are antioxidants. It is eaten as a raw and cooked vegetable and also used commonly in making paste, pickle, and sauce. Red ground chilli made by drying and pulverizing the hot red chilli is used as a spice and flavour. It is an important ingredient in the food industry [1].

Chilli fruits contain not only carotenoids as natural antioxidants but also other components like capsacin [n-vanillyl-8-methyl-6 (c) noeamide] responsible for pungency in chilli. It also contains ascorbic acid, which is present in relatively high amounts in ripened fruits. Ascorbic acid might play a positive role in ensuring the stability of final product and therefore their colour characteristics [8].

Drying of chilli is an important aspect for its valve addition [2]. The farmers generally practice open sun drying but it takes around 14-21 days, depending upon the weather conditions. The product from open sun drying is generally of poor colour and full of contaminations/ physical impurities. The retention of red colour is very important during drying as red coloured chilli fetches high prices in the market. Application of solar driers and mechanical driers further increases the quality of the final product and the drying took place in much shorter time. Thus, an investigation was undertaken to study the impact of pre-treatments and method on quality of chilli varieties.

MATERIAL AND METHODS

An investigation entitled "Effect of pre-treatment and drying methods on drying of red chilli (*Capsicum annum* L.) cultivars" was conducted in the Department of Post Harvest Management, College of Horticulture, Mandsaur in Jawaharlal Nehru Krishi Vishva Vidayala, Jabalpur during 2008-2009. For different treatment combinations, three levels of pre-treatments, two level of varieties, three level of pre-treatment, and four levels of method of drying and one control were taken in study. Thus 25 treatment combinations were dried in the present investigation.

Freshly harvested red chilli and powder of dried red chillies was used for the study. The red chilli of two varieties (US-622 and *SITARA*) was harvested from the field of a progressive farmer Shri Virendra Singh

Shaktawat of Mandsaur district. Damaged, diseased, and unripe pods were sorted out. The produce was then thoroughly washed with running tap water and wiped with dry cloth. The sample of 250g was weighed for different treatments after initial chemical analysis of fresh red chilli pods. For single replication nearly 5 kg of each variety was harvested out of which 3 kg of each variety were actually used in the experiment.

Varieties

Two varieties were used (a) US-622 (V_1) and (b) *SITARA* (V_2), 12 samples of 250gm of each variety was made *i.e.* a total of 24 samples were made.

Pre-treatments

Three samples were treated with three different pre-treatments.

1. For a single replication four samples of each variety were blanched at 90°C for 3 minutes i.e. a total of eight samples were used.
2. Four samples of each variety were blanched at 90°C for 3 min. and then soaked in gum acacia (0.2%) for 15 min., i.e. a total of eight samples were used.
3. Four samples of each variety were soaked in (2% Sodium chloride) for 30min and blanch i.e. a total of eight samples were used.

Methods of Drying

Four method of drying were used in the experiment *viz.* open sun drying, solar drying, shade drying and mechanical drying.

Moisture content

Moisture content was determined by standard official methods of analysis. This involves drying the desired material to a constant weight at suitable temperature and calculating moisture as the loss in weight of the dried samples. The percentage moisture content was calculated as loss in weight of the original samples. For evaluation of the moisture content of the dried chilli 70g of dried sample was kept in petri- dishes and the dishes are covered and then put in hot air oven and dried for 24 hr at 80^0 C. After the drying, cover was replaced, cooled in a desicator and weighed again. The moisture content is calculated by the following equation.

$$\text{Moisture (\%)} = \frac{W_2 \times 100}{W_1}$$

Where, W1 = Sample weight g, W_2 = Loss in weight of sample g

Recovery percentage

The recovery percentage of dried product was calculated by the following formula:

$$\text{Recovery percentage} = \frac{\text{Wt. of dried product}}{\text{Wt. of fresh products}} \times 100$$

Colour

The colour of the fresh red chilli pods was judged by visual method. Variety (V1) US-622, (V2) *SITARA* and local variety were bright red in colour.

RESULTS AND DISCUSSION

Final Moisture Content

The results pertaining to the final moisture content of chillies as affected by different pre-treatments, drying methods, and varieties are presented in Table 1. The minimum moisture content of 12.58 % was recorded in T3, whereas, the maximum of 12.95 % was recorded in T2. Moisture content of dried red chillies is significantly affected by drying methods. The maximum moisture content of 16.29% at D3 and minimum of 9.60% in D1 treatments were obtained. The moisture content of chilli was non-significantly affected by varieties. Among two varieties, the maximum moisture content of 13.00% was recorded while in V2 minimum of 12.52% was recorded in V1. However the moisture content of control was 12.33 %. The effect of treatment combination of variety and drying method treatments on moisture content of red dried chilli was found to be significant. The maximum moisture content of 16.89% was obtained in V2D3 while it was minimum 8.82% in V1D1 treatment combination. The moisture content of chilli was significantly affected by treatment combination of pre-treatment and drying method. The maximum moisture content of 17.78% was obtained in T3D3 while it was minimum 9.03% in T3D1. The maximum moisture content of 18.06% was obtained in V2T3D3 while it was minimum 8.50% in V1T1D1 and the moisture content in control was 12.33%. Among, the various four drying methods, the moisture content significantly affected, maximum moisture content at D3 (shade drying) and minimum at D1 (sun drying) treatments were obtained. The present findings are supported by Kumari *et al*. [4], Kumar *et al*. [3] and Muhidin and Hensel. [6]. They observed that in open sun drying the moisture content was 9.09 per cent and in solar drying the moisture content was 8.69 per cent.

Table 1 Effect of pretreatments and method of drying on quality of red chilli cultivars.

Treatment	Moisture content (%)	Recovery Percent	Colour value
Control	**12.33**	**19**	**3.83**
Blanching (at 90°C for 3min.) (T1)	12.76	20.38	6.76
Blanching and soaking in gum acacia (0.2%) for 15 min (T2)	12.95	20.29	6.86
Soaking in 2% sodium chloride for 30min. followed by blanching (T3)	12.58	19.96	6.63
S. Em.	**0.224**	**0.213**	**0.060**
CD at 5 %	**NS**	**NS**	**0.170**
Open sun drying (D1)	9.60	18.24	6.32
Solar drying (D2)	12.71	21.86	6.91
Shade drying (D3)	16.29	19.88	6.21
Mechanical drying (D4)	12.44	20.85	7.56
S. Em.	**0.259**	**0.246**	**0.069**
CD at 5 %	**0.737**	**0.699**	**0.197**
US-622 (V1)	12.52	19.25	6.00
SITARA (V2)	13.00	21.17	7.50
S. Em.	**0.183**	**0.174**	**0.049**
CD at 5 %	**NS**	**0.494**	**0.139**

Table 2 Combined effects of pretreatments and method of drying on moisture content of dried red chilli cultivars.

Treatment	V1			V2			Mean VXD		Mean TXD		
	T1	T2	T3	T1	T2	T3	V1	V2	T1	T2	T3
D1	8.50	8.80	9.16	12.30	10.00	8.89	8.82	10.40	10.40	9.40	9.03
D2	13.10	14.80	12.50	13.10	11.80	11.00	13.47	11.97	13.10	13.30	11.75
D3	13.50	16.10	17.50	15.80	16.80	18.06	15.70	16.89	14.65	16.45	17.78
D4	13.00	11.80	11.50	12.80	13.50	12.05	12.10	12.78	12.90	12.65	11.78
Mean VXT	12.03	12.88	12.67	13.50	13.03	12.50					
Control	12.33										

Treatments	**S. Em±**	**CD at 5 %**
VXT	0.317	0.903
VXD	0.367	1.042
TXD	0.449	1.277
VXTXD	0.635	NS

Recovery percent

The results pertaining to the recovery percentage of dried red chillies as affected by different pre-treatments, drying methods, and varieties are presented in Table 1. The minimum recovery percent of 19.96% was recorded in T3, whereas, the maximum recovery percent of 20.38% was recorded in T1. Recovery percent was significantly affected by drying methods. Maximum recovery percent of 21.86% in D2 and minimum of 18.24% in D1 treatments were recorded. The recovery percent of dried chillies was also significantly affected due to two varieties. In present investigation, between two varieties, the maximum recovery percent of 21.17% in V2 and minimum 19.25% in V1 were recorded. However, all the treatment, showed significantly higher recovery percent over control. Only D1 showed lower recovery percent (18.24%) as compared to control (19%). The recovery percent of dried chillies was not significantly affected by two-combined treatment of variety and pre-treatments (Table 4). The maximum recovery percent of (21.43%) was obtained in V2T1 while it was minimum of (18.89%) in V1T3 combination. The effect of treatment combinations of variety and drying methods on recovery percent of dried chillies was found to be significant (Table 4). The maximum recovery percent of (23.04%) was obtained in V2D2 while it was minimum of (17.91%) in V1D1. The maximum recovery percent of (22.20%) was obtained in T2D2 while it was minimum of (17.17%) in D1T3.It is clear from the data that combined application of pretreatments, drying methods and varieties showed non-significant effect on recovery percentage of dried chillies. However, untreated control recorded recovery percentage of (19%), whereas, the minimum of (16.93%) was obtained in V2T3D1 treatment. Among, the various four drying methods, the recovery percent maximum at D2 (solar drying) and minimum at D1 (open sun drying) treatments were obtained.

Colour

An examination of Table 1 reveals that three pre-treatment's significantly affected the pod's colour. The minimum of 6.63 was recorded in T3; whereas, the maximum value of colour 6.86 was recorded in T2. Pod's colour was significantly affected by drying methods. Maximum colour value of 7.56 in D4 and minimum value of 6.21 in D3 treatments were recorded. The colour value of dried pods was also significantly affected in the two varieties. In present investigation, among the two varieties, maximum colour value of 7.50 in V1 and minimum value of 6.00 in V2 were recorded. However, all (pre-treatments, drying methods, and varieties) showed significantly higher colour value over control (3.83). The maximum colour value of 7.59 was obtained in V2T2 while it was minimum of 6.10 in V1T1 combinations. The effect of treatment combinations of variety and method of drying on colour value of dried pods was found to be significant (Table 3). The maximum colour value of 8.32 was obtained in V2D4 while it was minimum of 5.39 in V1D1. The maximum colour value of 7.70 was obtained in T2D4 while it was minimum of 6.21 in T2D3. The maximum colour value of 8.46 was obtained in V2T2D4 while it was minimum of 5.33 in V1T3D1 and V1T2D3 treatment. The colour value was higher as compared to control (3.83). The present findings are supported by Kumari *et al*. [4]. Pawar *et al.* [7] reported that blanching and sulphitation were the important pretreatments for drying and dehydration of fruits and vegetables which helped colour retention. Similarly, Mangaraj *et al*. [5] also found that the colour of mechanically dried sample was the best followed by green house solar drying, solar cabinet and sun drying.

Table 3 Combined effect of pretreatments and methods of drying on recovery percent of red chilli cultivars

Treatment	V1			V2			Mean VXD		Mean TXD		
	T1	T2	T3	T1	T2	T3	V1	V2	T1	T2	T3
D1	18.4	17.93	17.4	19.93	18.86	16.93	17.91	18.58	19.17	18.40	17.17
D2	20.26	21.46	20.33	22.66	22.93	23.53	20.69	23.04	21.47	22.20	21.93
D3	18.66	18.93	18.26	21.33	20.66	21.46	18.62	21.16	20.00	19.80	19.87
D4	20	19.8	19.56	21.8	21.76	22.2	19.79	21.92	20.90	20.78	20.88
Mean VXT	**19.33**	**19.53**	**18.89**	**21.43**	**21.06**	**21.03**	**Control**	19			

Treatments	**S. Em±**	**CD at 5 %**
VXT	0.301	NS
VXD	0.348	0.988
TXD	0.426	NS
VXTXD	0.602	NS

Table 4 Combined effects of pretreatments and methods of drying on pod's colour of red chilli cultivars

Treatments	V1			V2			Mean VXD		Mean TXD		
	T1	T2	T3	T1	T2	T3	V1	V2	T1	T2	T3
D1	5.42	5.42	5.33	7.15	7.27	7.35	5.39	7.26	6.29	6.35	6.35
D2	6.71	6.85	5.63	7.34	7.53	7.40	6.40	7.42	7.03	7.19	6.52
D3	5.51	5.33	5.44	6.92	7.09	6.99	5.43	7.01	6.22	6.21	6.22
D4	6.74	6.93	6.72	8.31	8.46	8.19	6.80	8.32	7.53	7.70	7.46
Mean VXT	6.10	6.14	6.14	7.43	7.59	7.49	**Control**	**3.83**			

Treatments	**S. Em±**	**CD at 5 %**
VXT	0.084	NS
VXD	0.098	0.278
TXD	0.120	NS
VXTXD	0.169	NS

REFERENCES

1. Doymaz, I and Pala, M. (2002). Hot air drying characteristics of red pepper. *J. Food Eng*., **55**,331-335.
2. Kuchi, V.S., Gupta R. and Kachwaya, D.S. (2014). A review on dehydration of chilli. *Plant Archives* **14** (2): 637-642.
3. Kumar, R., Kumar, V., Singh, G R., Singh, B R., Singh, J and Kumar, P. 2017. Drying characteristics of green chillies under different dryer. *International Journal of Chemical Studies* **5**(4): 407-409.
4. Kumari, D., Papa., Sankar, C.R., Satyanarayana, C.H.V.V., Rao, B.V. (2003). Effect of chemical treatment and drying methods on drying time, pod length and pod damage of chilli (cv. LCA 235). *J. Food. Sci Technology*, **40(2):**233-235.
5. Mangaraj, S., Singh,A., Samuel, D.V.K. and Singhal, O.P. (2001). Comparative performance evaluation of different drying methods for chillis. *J. Food Sci. Technol*. **38**(3): 296-299.

6. Muhidin, R and Hensel, O. (2012). Influence of pre-treatment's on drying rates of chili pepper (*Capsicum annum* L.). *Agricultural Engineering International: CIGR Journal* **14** (1): 103-107.
7. Pawar, V.D., Patil, D. A., Khedkar, D.M. and Ingle, U.M. (1985). Studies on drying and dehydration of pumpkin. *Indian Food Packer*. July-August **4.** 58-66**.**
8. Simal, S., Garu, C., Femenia, A., Rossello, C. (2005). Drying of red pepper (*Capsicum annum*): Water desorption and quality. *International Jouranal of food Engineering.* **4(1).** 1-12.

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