Food Research 5 (4) : 38 - 46 (August 2021)
Journal homepage: http://www.myfoodresearch.com

FOOD
RESEARCH

Effect of pretreatments and temperature on rehydration kinetics of naga chili (*Capsicum chinense*)

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Article history:
Received: 10 December 2020
Received in revised form: 16 January 2021
Accepted: 20 March 2021
Available Online: 11 July 2021

Keywords:
Naga chili,
Pretreatment,
Drying,
Rehydration,
Rehydration kinetics

DOI:
https://doi.org/10.26656/fr.2017.5(4).725

Abstract

Naga chili (*Capsicum chinense*) is rich in capsaicin content that provides a distinctive aroma and strong pungency. Drying with pretreatment is regarded as a cost-effective approach to retain better nutrient quality, whereas rehydration properties consider a quality index to optimize the drying conditions. This study aimed to determine rehydration kinetics and rehydration characteristics of pretreated hot-air dried Naga chili. The pretreatment was consisting of water blanching (90°C for 5 mins), steam blanching (100°C for 1 min), microwave treatment (650 W for 100 s), and dipping into sugar 70°Bx, 0.5% citric acid, 2% ethyl oleate + 3% potassium carbonate, and 2% potassium meta bi-sulfite solution. After drying at 60°C, the rehydration was done at 25°C, 50°C, and 75°C, respectively. The rehydration kinetics were evaluated by fitting the experimental data into empirical kinetic models: Peleg's model, 2nd order, 1st order, and Zero-order kinetics. Among these models, the rehydration behavior was best described by Peleg's model, where the highest R^2 (0.9964), lowest χ^2 (0.0001) and RMSE (0.0064) values were obtained. Different rehydration characteristics such as moisture content, equilibrium moisture content, rehydration ratios were also determined. The highest moisture content (8.10 g moisture/g dry sample) was found at higher rehydration temperature (75°C), whereas the lowest moisture content ranges were recorded at 25°C. After moisture contents got equilibrium, the rehydrated samples gain weight to 100.15% at 75°C in comparison to the untreated samples. The rehydration ratios were also getting higher with increasing rehydration temperatures.

1. Introduction

Capsicum is a small genus that includes around 30 species, among which five have domesticated and considerable economic importance, namely, *C. annuum*, *C. chinense*, C. frutescens, *C. baccatum*, and *C. pubescens* (Naves *et al.,* 2019). The Naga Chili is the world's hottest chili, known as Ghost chili or Naga Jolokia, an interspecific hybrid between the species *Capsicum chinense* and *Capsicum frutescens* (Bosland and Baral, 2007) mostly found in the North-Eastern region of India (Dubey *et al.,* 2017). Naga chili is rich in capsaicin content (5.36%) (Liu and Nair, 2009), which provide extensive pungency and aroma, and widely consumed as fresh vegetables or dried spices in several cuisines, flavouring agent, and colorant (Loizzo *et al.,* 2015). Apart from culinary purposes, it has health and nutritional benefits like anti-inflammatory, antioxidant and weight reduction, for which it is often termed as functional foods (Naves *et al.,* 2019); these distinctive features drawing the attention of food manufacturers to valorise commercial products. However, the high moisture content (89%) and the thin skin owing it to preserve immediately after harvesting by drying and make it available throughout the year (Rabha *et al.,* 2017).

Pre-drying treatments have received considerable attention in recent years because they minimize energy consumption, drying time and maintain more nutritional quality of dried products (Gazor *et al.,* 2014). Chemical treatments (osmotic solution, alkali, acid, alkali and sulfite) and thermal treatments (hot water, steam, impingent, and microwave) both inactivate enzymes and fasten the drying rate by influencing the cell wall structure (Deng *et al.,* 2017). Pretreatments also enhance

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the rehydration capacity, which is regarded as the quality index representing the changes occurring during the drying process and their ability to restore its original conditions (Lee *et al.,* 2006; Doymaz and Özdemir, 2014). Therefore, the drying conditions should be optimized to develop a dried product with appropriate rehydration capabilities (Doymaz and Ismail, 2013).

During rehydration, the water temperature affects the rehydration kinetics and the rehydrated product moisture content. Rehydrated food's structural properties appear to indicate hysteresis relative to those measured during dehydration (Krokida and Philippopoulos, 2005). Regarding rehydration kinetics and characteristics, several studies have been reported on tomatoes (Lopez-Quiroga *et al.,* 2020), green olives (Aydar, 2020), green bell pepper (Kumar *et al.,* 2020), mango kernel (Das *et al.,* 2018), carrot (Doymaz, 2017) and okra (Kocabay and İsmail, 2017). However, any literature could not be found investigating the drying and simultaneously rehydration process of Naga chili.

Therefore, this study aimed to investigate the rehydration kinetics of rehydrated Naga chili, pre-treated with various physical and chemical pre-treatments, and investigate the rehydration kinetics of dehydrated Naga chili at different temperatures, and to fit into a suitable rehydration kinetics model.

2. Materials and methods

2.1 Sample preparation

In October 2019, 5 kg of fresh green Naga chili samples were collected from Bangladesh Agricultural Development Corporation (BADC) Agro Service Center, Kumargaon, Sylhet. Visually discoloured, diseased, damaged samples were removed to minimize biological variability. The samples were not in uniform shape and size; the average length of 4.5±0.2 cm, a diameter of 2.1±0.08 cm, and weight of 2.0±0.4 g were used for this experiment. The samples were cleaned with distilled water to remove extraneous materials. Before drying, four types of physical pre-treatments and three types of chemical pre-treatment were applied to the samples.

2.2 Pre-treatment methods

Before drying, samples were pre-treated with hot water blanching (HWB) at 90°C for 5 mins (Cheng *et al.,* 2015), steam blanching (SB) at 100°C for 1 min (Araújo *et al.,* 2016), and microwave treatment (MT) at 650W (watts) for 100 s (Başkaya Sezer and Demirdöven, 2015), respectively. Furthermore, samples were chemically pre-treated by immersing into 70°Bx sugar solution (hyper-osmotic solution or OS) for 6 hrs (Torreggiani, 1993), 0.5% citric acid solution (CITRIC) for 2 mins (Doymaz and Ismail, 2013), 2% potassium metabisulfite (KMS) at room temperature for 5 mins (Krokida *et al.,* 2000), and 2% Alkali Emulsion Ethyl Oleate (AEEO) with 3% Potassium Carbonate for 1 min (Doymaz and Ismail, 2013), respectively. The untreated samples served as a control sample.

2.3 Drying process

After pre-treatment, the samples were uniformly spaced and placed on metal trays and dried in a constant temperature and humidity chamber (VS-8111H, Vision scientific, Korea). The convective drying temperature of 60°C and constant humidity of 50% was maintained during the drying process. The dryer was set to the selected temperature for about 30 mins before drying commenced, and thus stable conditions were attained. Almost all the samples were taken about 18 to 22 hrs to reach 11% of the fresh weight. The samples' moisture content was determined according to the method of AOAC method (2012).

2.4 Rehydration process

Before rehydration, each sample was divided into batches to rehydrate them into three different temperatures as 25°C (room temperature), 50°C, and 75°C. The samples were not agitated during rehydration to avoid the possibility of tearing up. After taking off the rehydrated samples from the hot water bath, extra surface water was removed using filter paper (Al-Amin *et al.*, 2015). The rehydration process continued for 10 hrs, and the mass of the rehydrated samples was measured by an analytical balance (Shimadzu AY 220, Japan) at 30 mins of interval.

A parameter for rehydration is the equilibrium moisture content (EMC), which can be determined using the following equation (Doymaz and Ismail, 2013):

$$\mathrm{EMC} = \frac{m_e - m_0}{m_e} \tag{1}$$

where m_e is the equilibrium mass of the rehydrated Naga chili and m_0 is the initial mass of the dried Naga chili.

The rehydration capability of dehydrated products is usually expressed by the rehydration ratio (RR) given by the following equations (Krokida and Marinos-Kouris, 2003):

$$\mathrm{RR} = \frac{(X+1)}{(X_i+1)} \tag{2}$$

where, X is the material moisture content during rehydration (g moisture/g dry sample) and when X is zero, the moisture content of the dry material (g moisture/g dry sample) is equal to X_i (initial moisture content, db).

2.5 Rehydration kinetics models

The Peleg model, a second-order kinetic model, and a first-order kinetic model were chosen to describe mass transfer phenomena in the rehydration process. The best fit of the experimental data for this experiment has been investigated.

2.5.1 First-order and zero-order kinetic models

It was based on the following assumptions: the water temperature will be constant during rehydration, and the initial water content of samples will be uniform (Krokida and Philippopoulos, 2005).

$$\frac{d(X)}{dt} = -k_r(X - X_e) \qquad (3)$$

where X is the material moisture content during rehydration (g moisture/g dry sample), K_r is the rehydration rate (min^{-1}), X_e is the equilibrium moisture content of the rehydrated material (g moisture/g dry sample), and t is the rehydration time (min). At zero-time, X is equal to X_i, the moisture content of the dry material (g moisture/g dry sample), and equation (3) shall be integrated to provide the following expression:

$$X = X_e - (X_e - X_i)e^{-k_r t} \qquad (4)$$

The equilibrium moisture content, X_e, expresses the water concentration at saturation. Equation (4) is the first-order kinetic equation. The zero-order of the equation (4) is as follows:

$$(X_e - X) = -k_r * t + (X_e - X_i) \qquad (5)$$

2.5.2 Second-order kinetic model

A simple kinetic analysis is a second-order equation in the form of (Doymaz and Ismail, 2013):

$$\frac{dR}{dt} = k_R(R_{max} - R)^2 \qquad (6)$$

where $\frac{dR}{dt}$ is the rehydration ratio, k_R is the rate constant of rehydration, R_{max} denotes the degree of rehydration at equilibrium, and *R* is the rehydration ratio at *t*. After definite integration by applying the initial conditions *R* = 0 at *t* = 0 and *R* = R_{max} at *t* = *t*, Equation (6) becomes:

$$\frac{t}{R} = A + B * t \qquad (7)$$

Where $A(=\frac{1}{k_R * R_{max}^2})$ is the inverse of the initial rehydration rate (1/r), and B (= $1/R_{max}$) is the inverse of the maximum rehydration value.

2.5.3 Peleg's model

Peleg's equation assumes the linear form which is given as (Das *et al.,* 2018; Ergün *et al.,* 2016):

$$\frac{t}{M_t - M_0} = k_1 + k_2 * t \qquad (8)$$

Where, M_t is the moisture (g H_2O/g dry matter) at time t, M_0 (g H_2O/g dry matter) is the initial moisture, t is the rehydration time (min), k_1 is the kinetic constant of the model [min. (g dry matter/g H_2O)], and k_2 is the characteristic of the model (g dry matter/g H_2O). If the rehydration is long enough, the equilibrium moisture content (M_e) (g H_2O/g dry matter) is given in as:

$$M_e = M_0 + \frac{1}{k_2} \qquad (9)$$

2.6 Fitting into the suitable models

The proper fit was determined using the coefficient of determination (R^2), the root means square error (RMSE), and the reduced Chi-square (χ^2). RMSE and Chi-square are described as Equations (10) and (11), respectively.

$$RMSE = \left[\frac{1}{N}\sum_{i=1}^{N}(X_{pre,i} - X_{exp,i})^2\right]^{\frac{1}{2}} \qquad (10)$$

$$x^2 = \frac{\sum_{i=1}^{N}(X_{pre,i} - X_{exp,i})^2}{N - n} \qquad (11)$$

where $X_{exp,\,i}$ and $X_{pre,\,i}$ is the experimental and predicted moisture ratio at observation i; N is the number of the experimental data points, and n is the number of constants in the model.

R^2 values are obtained by fitting experimental data in the models using Microsoft excel. RMSE and Chi-square were also calculated in Microsoft Excel 2019.

3. Results and discussion

3.1 Moisture content

The experimental data for moisture content for all the examined samples during rehydration are presented in Figure 1. The results showed that moisture contents ranging from 0.0 to 3.33 g moisture/g dry samples at 25°C, 0.0 to 7.91 g moisture/g dry samples at 50°C, and 0.0 to 8.10 g moisture/g dry samples at 75°C. The equilibrium moisture content at saturation has not reached the moisture content of raw materials (Except for AEEO samples at 75°C), indicating that the dehydration procedure is irreversible. Krokida and Marinos-Kouris (2003) found a similar trend in their experiment. It was found that the equilibrium moisture content (of apple, potato, carrot, banana, pepper, garlic, mushroom, onion, leek, pea, corn, pumpkin, and tomato) at saturation has not reached the moisture content of raw materials during rehydration at different temperatures.

The moisture contents of all the samples were increased after rehydration. No matter which pre-treatments the samples received, the moisture content or the water absorption changed incrementally with the temperature increase. Among all the samples, AEEO pre-treated samples had the highest moisture at the end of

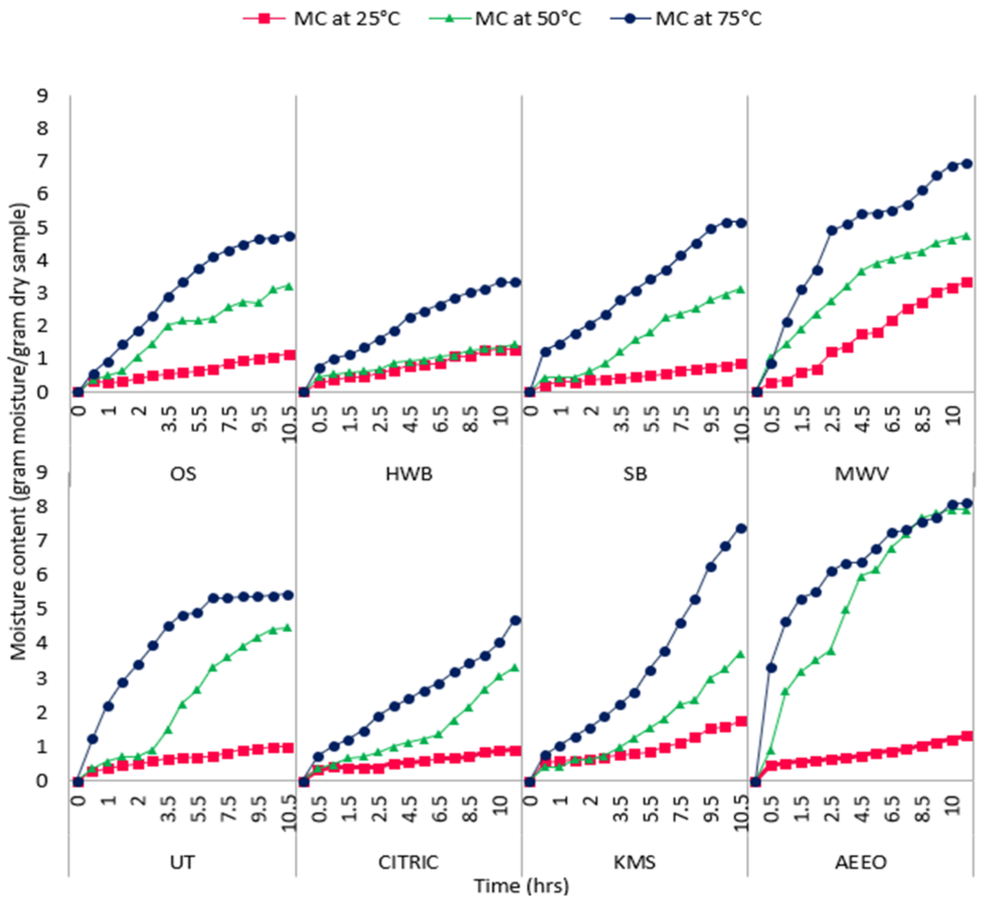


Figure 1. Moisture content vs time graphs of the samples during rehydration at 25°C, 50°C and 75°C

the procedure at 50°C and 75°C. Microwave pre-treated samples had the maximum moisture at room temperature (25°C) and medium at higher temperatures. This indicates that microwave pre-treatment did not damage the samples' internal structure but maintained a medium rate during drying by making holes on the surface. This phenomenon proves the hysteresis occurs between drying and rehydration of food samples (Mujumdar, 2014).

3.2 Equilibrium moisture content

In all the cases of different pre-treated and dried Naga chilis, a continuous increase of EMC after rehydration can increase temperature. The highest values can be seen in AEEO samples at 75°C and the lowest in SB samples at 25°C. At 25, 50, and 75°C, SB, HWB, and HWB samples had the lowest values while KMS, AEEO, and AEEO samples had the highest values. Among the pre-treated physical samples, MT samples had the highest at all three different temperature values though lower than the values of chemical pre-treated samples' highest values mainly comprised of AEEO pre-treated samples. Doymaz and Ismail (2013) also found similar results where he pre-treated green bell peppers with different chemicals and found at all rehydration temperatures (25°C, 50°C, 75°C); the equilibrium moisture contents were highest for the pre-treated with AEEO solution. Percentages of equilibrium moisture contents are shown in Table 1.

3.3 Rehydration ratio

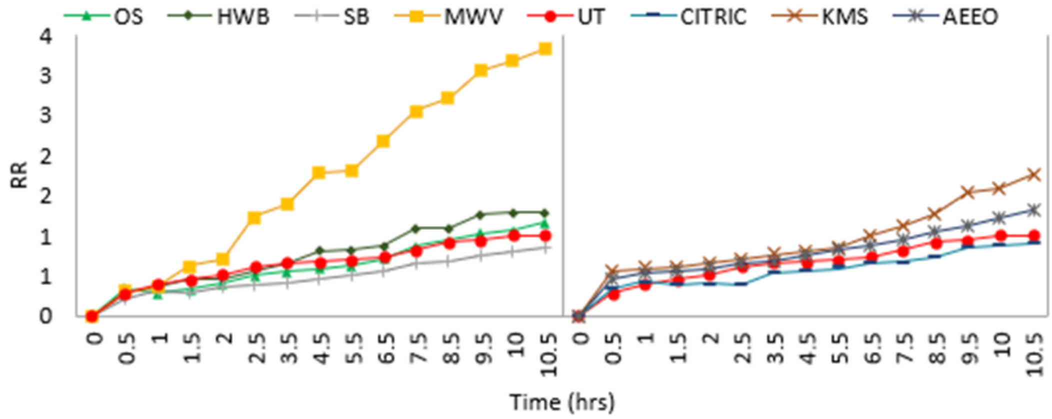
The rehydration ratio (RR) usually expresses the water absorb capability of dehydrated products. The experimental data for the rehydration ratio are presented in Figure 2. The rehydration ratio ranges between 0.20 and 3.53 at 25°C, from 0.20 to 8.11 at 50°C and from 0.20 to 8.30 at 75°C for all the examined materials, having the higher values for MWV, AEEO, and AEEO samples, respectively. The reduced hydrophilic properties give lower rehydration ratio values and the

Table 1. Percentages of equilibrium moisture contents after rehydration

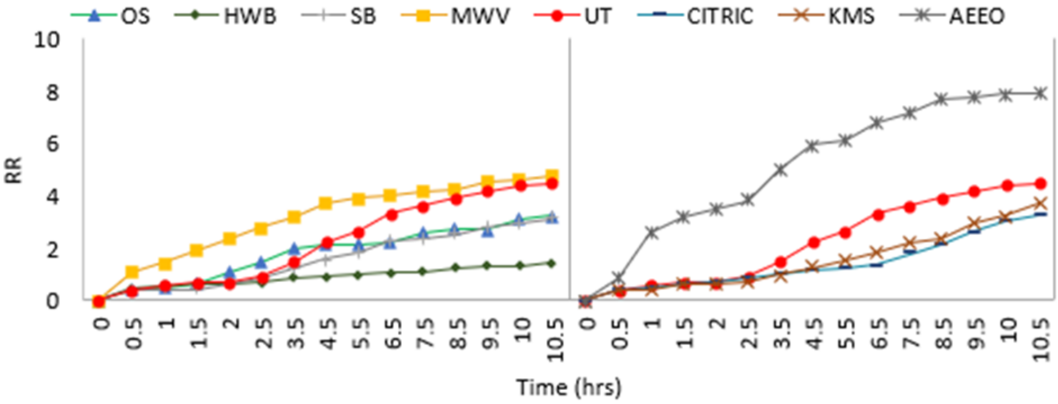
Temperature (°C)	Equilibrium moisture content (%)							
	Types of samples							
	0S	HWB	SB	MWV	UT	CITRIC	KMS	AEEO
25	23.70	25.16%	20.38%	47.66%	22.01%	20.92%	30.31%	25.58%
50	46.49	26.82%	45.42%	63.26%	60.18%	47.26%	51.91%	98.03%
75	63.27	47.77%	67.78%	87.75%	70.79%	62.55%	92.22%	100.00%

OS = hyper-osmotic solution, HWB = hot water blanching, SB = steam blanching, MWV = microwave treatment, UT = untreated, CITRIC = citric acid solution, KMS = meta bi-sulphite solution, AEEO = alkali emulsion ethyl oleate.

(a) RR at 25 °C



(b) RR at 50 °C



(c) RR at 75 °C

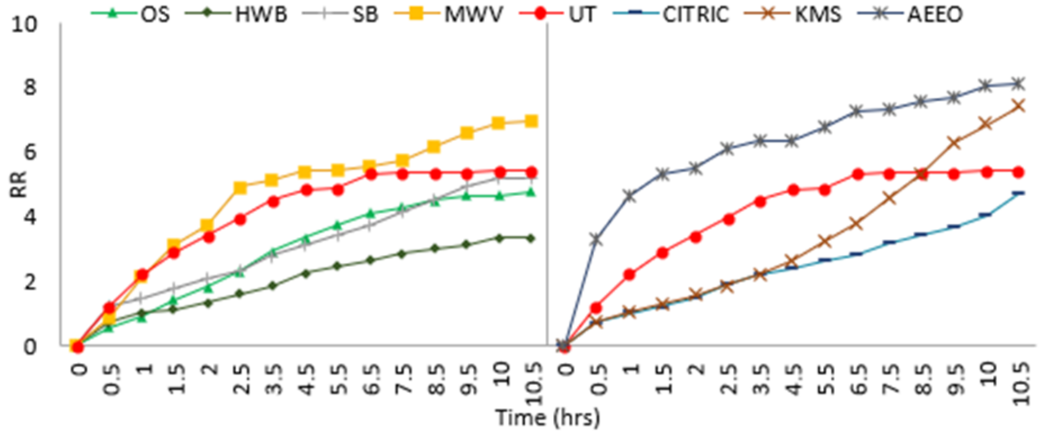


Figure 2. RR (rehydration ratio) of the samples at (a) 25°C, (b) 50°C and (c) 75°C

inability to imbibe sufficient water, leaving pores unfilled. Consequently, lower RR values are caused by structural damages taking place during dehydration. Krokida and Marinos-Kouris (2003) observed similar phenomena while working with apple, potato, carrot, banana, pepper, garlic, mushroom, onion, leek, pea, corn, pumpkin, and tomato samples.

With an increase in rehydration temperature, the rehydration ratio of each type of sample also gets increased. Chemically pre-treated samples had higher RR values as the chemicals removed the outer waxed layer. During physical pre-treatment, apart from outer layer removal, samples also get softened, which might have caused more damage to the overall structure and hence the RR values were lower than untreated samples. Olivera *et al.* (2008) also found a similar observation, where Brussels sprouts (*Brassica oleracea* L. *gemmifera* DC) texture and microstructures were negatively influenced during hot water and steam blanching. It was also seen that with the increase of temperature difference at a 5% level of significance, RR values increased among the different pre-treated samples. Doymaz and Ismail (2013) similarly found that the rehydration ratio of AEEO pre-treated green bell pepper was the highest among AEEO, CITRIC, and UT samples. However, MT samples retained the highest values among the physically pre-treated samples. Maskan (2001) similarly found that kiwifruits dried by combined hot air–microwave displayed higher rehydration capacity than those of kiwifruits dried by microwave or hot air drying without pre-treatment.

3.4 Rehydration kinetics

The model fitted data for all the examined samples during rehydration are presented in Table 2, and rehydration rates are presented in Table 3. For the rehydration process of the Naga chili, the highest R^2 value (0.9964) and the χ^2 (0.0001) values were obtained from both the Peleg's model and 2nd order kinetics model. The lowest RMSE (0.0064) was obtained from Peleg's model. However, none of the models gave stand-alone best values and cannot be described as the best fit for all the samples. Therefore, rehydration rates were determined using all of them. For finding out a special rehydration rate, all the test values regarding that sample should be gone through first manually. Besides, 1st order and zero-order models show an average rehydration rate while 2nd order and Peleg's model show rehydration rate at a particular time. So, it should be considered first before going through the data.

The 2nd order kinetics produced initial rehydration rate values, 1st order and Zero order kinetic models produced average rehydration rate values, while Peleg's model produced model constants (k_1 and k_2), which can be used to determine rehydration rate at any point of time. With the increase in temperature, the rate of rehydration increased. However, the different pre-treated samples showed growth in the rehydration rate differently. Interestingly the UT samples had the highest rate at maximum temperature, and the pre-treated samples had considerably lower values. Although at medium and room temperature, the most pre-treated

Table 2. Model fitting data

Entity	Model	T (°C)	Types of samples							
			HS	HWB	SB	MT	UT	CITRIC	KMS	AEEO
RMSE	Peleg's	25	0.2039	0.1233	0.2449	0.0566	0.1215	0.2153	0.1940	0.1551
		50	0.0524	0.0948	0.0902	0.0083	0.0680	0.1510	0.1172	0.0097
		75	0.0111	0.0281	0.0274	0.0147	0.0063	0.0402	0.0469	0.0064
	2nd order	25	1.0197	0.6166	1.2245	0.2831	1.5298	1.0765	1.3935	0.7759
		50	0.2622	0.4740	0.4512	0.0417	0.3402	0.7554	0.5864	0.0486
		75	0.0555	0.1405	0.1370	0.0737	0.0317	0.2012	0.2348	0.0321
	1st order	25	0.1592	0.1303	0.1594	0.3364	0.2324	0.2924	0.2732	0.2375
		50	0.1169	0.1770	0.2665	0.1286	0.5219	0.1788	0.2436	0.8509
		75	0.2251	0.1123	0.3044	0.4129	0.2244	0.1146	0.1850	0.3408
	Zero order	25	0.0574	0.1480	0.0642	0.0366	0.0940	0.0856	0.0760	0.0788
		50	0.0918	0.0790	0.0344	0.1103	0.0398	0.0721	0.0548	0.1008
		75	0.0955	0.0736	0.0589	0.1362	0.1561	0.0557	0.0417	0.1417
R^2	Peleg's	25	0.8323	0.9048	0.8816	0.5648	0.9586	0.9044	0.7565	0.9036
		50	0.8431	0.9491	0.3902	0.9948	0.0507	0.3640	0.2135	0.9733
		75	0.9839	0.9669	0.9281	0.9659	0.9964	0.8884	0.3876	0.9934
	2nd order	25	0.8323	0.9048	0.8816	0.5648	0.9586	0.9044	0.7565	0.9036
		50	0.8431	0.9491	0.3902	0.9948	0.0507	0.3640	0.2135	0.9733
		75	0.9839	0.9669	0.9281	0.9659	0.9964	0.8884	0.3876	0.9934
	1st order	25	0.9239	0.9490	0.9217	0.8659	0.9103	0.8092	0.8168	0.8610
		50	0.9657	0.9313	0.9024	0.9787	0.8066	0.8391	0.8323	0.9248
		75	0.9597	0.9815	0.8759	0.8535	0.9831	0.9556	0.8730	0.8261
	Zero order	25	0.9574	0.9631	0.9427	0.9875	0.8818	0.8907	0.9122	0.8980
		50	0.9199	0.9116	0.9890	0.8628	0.9874	0.9394	0.9797	0.9011
		75	0.9180	0.9401	0.9601	0.8004	0.7400	0.9581	0.9815	0.6894
χ^2	Peleg's	25	0.0485	0.0177	0.0700	0.0037	0.0172	0.0541	0.0439	0.0281
		50	0.0032	0.0105	0.0095	0.0001	0.0054	0.0266	0.0160	0.0001
		75	0.0001	0.0009	0.0009	0.0003	0.0001	0.0019	0.0026	0.0001
	2nd order	25	1.2132	0.4437	1.7495	0.0935	2.7304	1.3520	2.2657	0.7025
		50	0.0802	0.2621	0.2376	0.0020	0.1351	0.6658	0.4012	0.0028
		75	0.0036	0.0231	0.0219	0.0063	0.0012	0.0472	0.0644	0.0012
	1st order	25	0.0275	0.0185	0.0275	0.1219	0.0585	0.0926	0.0804	0.0608
		50	0.0148	0.0340	0.0829	0.0179	0.2933	0.0346	0.0639	0.7798
		75	0.0549	0.0137	0.1004	0.1836	0.0542	0.0142	0.0371	0.1259
	Zero order	25	0.0035	0.0235	0.0052	0.0017	0.0111	0.0079	0.0062	0.0067
		50	0.0091	0.0067	0.0013	0.0130	0.0017	0.0056	0.0032	0.0109
		75	0.0098	0.0058	0.0037	0.0200	0.0261	0.0033	0.0019	0.0215

R^2 = coefficient of determination, RMSE = root-mean-square error, χ^2 = Chi-square.

Table 3. Rehydration rates by different models

Entity	model	T(°C)	Types of samples							
			OS	HWB	SB	MWV	UT	CITRIC	KMS	AEEO
Rate of rehydration	Peleg's (k_1)	25	0.6871	0.5582	0.7668	0.4495	0.4380	0.5597	0.1006	0.1397
		50	0.3068	0.3460	0.4768	0.0971	0.4071	0.4868	0.5176	0.0795
		75	0.1634	0.1822	0.1279	0.0697	0.0543	0.1902	0.2240	0.0257
	2nd order (r)	25	0.2910	0.3582	0.2608	0.4449	0.4566	0.3573	0.4676	0.5058
		50	0.6518	0.5780	0.4194	2.0593	0.4912	0.4108	0.3864	2.5150
		75	1.2239	1.0979	1.5642	2.8677	3.6805	1.0514	0.8927	7.7821
	1st order (k_r)	25	0.1885	0.2149	0.1953	0.2258	0.2650	0.2249	0.1802	0.2024
		50	0.2080	0.2355	0.2162	0.3005	0.2686	0.1220	0.1445	0.3630
		75	0.3296	0.2669	0.2550	0.3099	0.5132	0.1660	0.1446	0.3357
	Zero order (k_r)	25	0.0768	0.0835	0.0737	0.0921	0.0726	0.0691	0.0693	0.0662
		50	0.0855	0.0718	0.0922	0.0782	0.0989	0.0803	0.0785	0.0860
		75	0.0904	0.0825	0.0817	0.0754	0.0745	0.0753	0.0860	0.0597
k_2	Peleg's	25	0.1336	0.1118	0.1965	0.0190	0.1719	0.1947	0.4276	0.3954
		50	0.0357	0.1204	0.0212	0.0340	0.0046	0.0336	0.0180	0.0173
		75	0.0255	0.0447	0.0290	0.0231	0.0310	0.0334	0.0110	0.0232
k_r	2nd order	25	0.2183	0.2162	0.3586	0.0400	0.4558	0.4393	0.1518	0.2877
		50	0.0626	0.2793	0.0428	0.0912	0.0245	0.0378	0.0279	0.0401
		75	0.0542	0.0982	0.0587	0.0589	0.1245	0.0478	0.0163	0.1184

k_r and k_2 are rate constants. OS = hyper-osmotic solution, HWB = hot water blanching, SB = steam blanching, MWV = microwave treatment, UT = untreated, CITRIC = citric acid solution, KMS = meta bi-sulphite solution, AEEO = alkali emulsion ethyl oleate.

samples had significantly higher values than UT samples.

4. Conclusion

In this experiment, Naga chili, untreated and pre-treated with different thermal blanching and chemical solutions before drying, and the dried products rehydrated at three different temperatures (25°C, 50°C, and 75°C) to observe the rehydration behaviour and kinetics. Chemical pre-treatments, like AEEO treated samples at higher rehydration temperature (75°C) showed the highest moisture content, equilibrium moisture, and rehydration ratios. In order to find the best-fitted model for the rehydration kinetics, the highest R^2 value (0.9964) and the χ^2 (0.0001) values were obtained from both the Peleg's model and 2nd order kinetics model, and the lowest RMSE (0.0064) was obtained from Peleg's model. Therefore, Peleg's model was explaining best the rehydration kinetics of Naga chili.

Conflict of interest

The authors declare no conflict of interest.

Acknowledgments

The authors acknowledge with thanks for the financial assistance received to carry out the study from the Shahjalal University of Science and Technology (SUST) research centre (project code: AS/2019/1/30) and also thankful to the Department of Food Engineering and tea Technology of Shahjalal University of Science and Technology, Sylhet, Bangladesh for their facilities.

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