

Study on Drying characteristics of chemical treated slit green chillies under Hot air oven

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ABSTRACT

Chilli (*Capsicum annum L.*) is one of the important commercial crops of India. It is a crop of tropical and subtropical regions and requires a warm humid climate. Chilli is a highly perishable vegetable with a short shelf-life and commonly encounter postharvest problems; to deal such problems, drying was done using hot air oven. Three different temperatures (50, 60 & 70 °C) use in hot air oven. Before drying chillis were slitted and treated with Butylated Hydroxy Anisole and Potassium Carbonate solution. Overall drying rate increased with temperature in hot air oven. Drying of dipsolgreen chilli took place in falling rate period. Initial moisture content of the green chilli was an average of 84.20±1 % w.b.

Keywords: Dipsol Slit Green Chilli, Drying, Hot Air Oven, Moisture Content, Moisture Ratio & Average Drying Rate.

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INTRODUCTION

Chilli (*Capsicum annum*) belongs to the "Solanaceae" family. It is rich in vitamins; especially vitamin C [5]. Capsicum has synonyms according to their geographical area and region. There are five cultivated species of the genus Capsicum *C. frutescens*, *C. chinense*, *C. pubescens*, *C. baccatum* and *Capsicum annum* but *Capsicum annum* is the most widely cultivated in all over the India for its characteristics like- non-pungent and pungent.

In India, only two species viz. *Capsicum annum* and *Capsicum frutescens* are known and most of the cultivated varieties belong to the species *Capsicum annum* [6]. Chilli was introduced in India by the Portugese in Goa in the middle of 17th century and since then it had rapidly spread throughout the country [8]. Throughout the world, chili is consumed fresh, dried or in powder [2]. It is rich in proteins, lipids, carbohydrates, fibres, mineral salts (Ca, P, Fe) and in vitamins A, D3, E, C, K, B2 and B12 [2]. The fruits are an excellent source of health-related phytochemical compounds, such as ascorbic acid (vitamin C), carotenoids (provitamin A), tocopherols (vitamin E), flavonoids, and capsaicinoids that are very important in preventing chronic diseases such as cancer, asthma, coughs, sore throats, toothache, diabetes and cardiovascular diseases [2, 9].

There are many types of dryer instrument used in the domestic and industry sectors. The commonly used dryer are tunnel dryers, tray dryers, fluidized bed drying, drum dryers, spray dryers, rotary dryers, flash dryers, vacuum dryers, freeze dryers (lyophilizer). Currently, hot air drying is more popularly used for drying of chilli due to a relatively short time of drying and also due to uniform heating and more hygienic characteristics.

The most important reasons for popularity of dried products are longer shelf-life, product diversification as well as substantial volume reduction to decrease transportation cost. This

could be further expanded by improvements in product quality and process applications [7]. Lantz [3] reported that slicing or slitting pods of red chilli reduced the drying time by half, and there was no loss of initial color. Carried out an experiment on whole and sliced pods and found that drying of sliced pods reduced the drying time by 50% and superior initial color was obtained.

MATERIAL AND METHODS

The main objective of this experiment is to study the drying characteristics of dipsol slit green chillis. The experiments were carried out in the Food Processing Laboratory of the department of agricultural engineering, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut-250110, (U.P.) India.

Drying methods: The chilli samples were treated with Butylated Hydroxy Anisole and Potassium Carbonate solution than dried using hot air oven at three different temperatures, viz. (50, 60 & 70 °C).

Hot air oven drying: The chilli samples were kept on hot air oven at 60, 70, 80±5°C till no further weight loss occurred. Hot air oven (Instron, IN-301 Model) used is a double walled chamber of size 78×27×116 (in centimeter). Outer chamber is made of stainless steel. Hot air ovens are electrical devices used in sterilization. The oven uses dry heat to sterilize articles. Generally, they can be operated from 50 to 300 °C (122 to 572 °F).

Drying characteristics analysis:

Moisture content: Moisture content and total solids will be determined by method of AOAC [1]. The moisture content (% w.b.) of sample was calculated by using following equation:

$$M C\% (w. b.) = \frac{(\text{initial weight} - \text{final weight})}{\text{initial weight}} \times 100$$

Measurement of Moisture ratio: Moisture ratio (MR) will be calculated as follows:

$$MR = \frac{M - M_e}{M_a - M_e}$$

Where

M_e - Equilibrium moisture content, %db

M - Moisture content at any time, %db

M_a - Moisture content at the start of drying, %db

Average drying rate: The average drying rates at different times were computed using formula suggested by [4].

RESULT AND DISCUSSION

Results of Dipsol slit green chillis drying with hot air oven at three different temperatures, are presented in following heads. Samples were dried until they stop losing moisture. Moisture content (wb %), dehydration ratio and average drying rate was measured. Dehydration ratio is an important factor, which shown bulk reduced in weight of the sample.

Drying Characteristics hot air oven drying: Dipsol slit Green chilli dried using hot air oven dryer at three different temperature viz. 50, 60 & 70 °C.

At 50 °C moisture content (wb %) ranges from 84.20 to 13.42. Moisture ratio and average drying rate were ranged from 1.00 to 0.00 and 1.56 to 0.05 respectively after 660 minute (Table 1). Moisture content (wb %) ranges from 84.20 to 11.73 at 60 °C. Moisture ratio and average drying rate were ranged from 1.00 to 0.00 and 1.61 to 0.03 respectively after 660 minute (Table 2). At 70 °C, moisture content (wb %) ranges from 84.20 to 11.73. Moisture ratio and average drying rate were ranged from 1.00 to 0.00 and 2.05 to 0.04 respectively after 600 minute (Table 3).

CONCLUSION

The study revealed that the moisture content decreased with increase in temperature. It was also observed that dipsol treated sample take less time for drying as compared with untreated samples in all drying methods. On the basis of drying time, drying temperature of 60°C was found to be best statistically. So the material dried at 60°C was selected for storage

Table.1. Drying characteristics behavior of dipsol slit chilli at 50 °C under Hot Air oven.

Time (MIN)	MC (wb) %	MC (db) %	Moisture ratio	Average drying rate
0	84.20	532.91	1.00	
60	81.47	439.56	0.82	1.56
120	78.21	358.86	0.66	1.34
180	73.83	282.12	0.52	1.28
240	68.15	213.92	0.38	1.14
300	60.00	150.00	0.26	1.07
360	48.32	93.51	0.15	0.94
420	39.23	64.56	0.09	0.48
480	30.55	43.99	0.06	0.34
540	20.60	25.95	0.02	0.30
600	15.73	18.67	0.01	0.12
660	13.42	15.51	0.00	0.05

Table.2. Drying characteristics behavior of dipsol slit chilli at 60 °C under Hot Air oven.

Time (MIN)	MC (wb) %	MC (db) %	Moisture ratio	Average drying rate
0	84.20	532.91	1.00	
60	81.36	436.39	0.81	1.61
120	78.28	360.44	0.67	1.27
180	74.27	288.61	0.53	1.20
240	69.05	223.10	0.40	1.09
300	62.16	164.24	0.29	0.98
360	52.91	112.34	0.19	0.86
420	40.38	67.72	0.10	0.74
480	29.78	42.41	0.06	0.42
540	17.60	21.36	0.02	0.35
600	13.19	15.19	0.00	0.10
660	11.73	13.29	0.00	0.03

Table.3. Drying characteristics behavior of dipsol slit chilli at 70 °C under Hot Air oven.

Time (MIN)	MC (wb) %	MC (db) %	Moisture ratio	Average drying rate
0	84.20	532.91	1.00	
60	80.39	409.97	0.76	2.05
120	76.04	317.41	0.58	1.54
180	69.37	226.42	0.41	1.52
240	62.04	163.45	0.29	1.05
300	51.01	104.11	0.17	0.99
360	35.51	55.06	0.08	0.82
420	26.51	36.08	0.04	0.32
480	17.92	21.84	0.01	0.24
540	13.42	15.51	0.00	0.11
600	11.73	13.29	0.00	0.04

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