Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; SP1: 191-194

Jaivir Singh
Department of Agricultural Engineering and Food Technology Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, India

Ekta sharma
Department of Agricultural Engineering and Food Technology Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, India

Dinesh Kumar Yadav
Department of Agricultural Engineering and Food Technology Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, India

Neelesh Chauhan
Department of Agricultural Engineering and Food Technology Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, India

Vivak Kumar
Department of Agricultural Engineering and Food Technology Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, India

Samsher
Department of Agricultural Engineering and Food Technology Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, India

Suresh Chandra
Department of Agricultural Engineering and Food Technology Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, India

Correspondence
Ekta sharma
Department of Agricultural Engineering and Food Technology Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, India

Studies on physico-chemical properties of osmo-dehydrated sweet potato slices during their storage.

Jaivir Singh, Ekta sharma, Dinesh Kumar Yadav, Neelesh Chauhan, Vivak Kumar, Samsher and Suresh Chandra

Abstract
Sweet potato (*Ipomoea batatas*) is an important source of food and energy for millions of people in the tropics where they are grown continuously throughout the year (Huang *et al.* 2010). Sweet potato is one of the five most important food crops in developing countries. It is one of the most efficient food crops in terms of caloric value per cultivated area, being relatively easy to grow even on poor and dried soil. The dry matter production potential of certain varieties of sweet potato vines may be as high as 4.3–6.0 tons per hectare. The value of sweet potato is attributed to high yield, palatability and crude protein content. Sweet potato, which is one of the most important tubers, is largely distributed in the tropical area. It plays a basic role in the people's diet of tropical countries. Tropical tubers are either home processed or industrially processed at various scales. Nowadays, industrial processes must be improved in order to enhance tuber uses and to satisfy consumption requirements (Cnph. Embrapa, 2005).
Osmotic dehydration is widely used for the partial removal of water from plant tissues by immersion in a hypertonic (osmotic) solution. The driving force for the diffusion of water from the tissue into the solution is provided by the high osmotic pressure of the hypertonic solution. The diffusion of water is accompanied by the simultaneous counter diffusion of solute from the osmotic solution into the tissue. Since the membrane responsible for osmotic transport is not perfectly selective, other solutes present in the cells can also be leached into the osmotic solution (Kowalska *et al*. 2001; Park *et al*. 2002). Osmotic dehydration is generally used as an upstream treatment before further processing such as freezing, freeze drying, vacuum drying and air drying. It also increases sugar to acid ratio, improves texture and stability of the pigment and increase storage (Raoult-Wack *et al*. 1994). It is effective even at ambient temperature, so heat damage to texture, colour and flavour of food are minimized (Torregginni *et al*. 2001; Rastogi *et al*. 2004).

Keywords: physico-chemical, sweet potato slices, Osmotic dehydration

Introduction

Materials and Methods

In present study, experiments were carried out to study the effect of tray drying and solar drying on physico-chemical characteristics of osmo-dehydrated sweet potato slices. This experiment is carried out in the Food Analysis Laboratory, SVPUAT Meerut. The experimental techniques and steps adopted during the present investigation have been elaborated in this chapter. Experiments were conducted to investigate different drying characteristics of sweet potato slices under different drying condition of osmotic dehydration after standardizing the pre-treatment of sweet potato slices. During the process, osmosis was carried out in sucrose solution at a varying concentration of 30^0B and 40^0B using a sample to solution ratio 1:10. Osmosis was conducted manually at regular intervals to maintain uniform temperature. For using sweet potato slices sample 500 gm. At each experimental condition osmotic dehydration was carried out for 2 h and at each design time (after every 15 min intervals), samples were analyzed for moisture content.
The sweet potatoes were procured from the local market of Meerut. The sweet potato were then graded, washed, peeled and cut into 2 mm and 4 mm slices. The slices were put in osmotic solution having sugar concentration ranging from 30^0 and 40^0 Brix for 120 minutes. They were then dried in tray drier (60^0C) and solar drying respectively. The dried samples from each experiment were packed in LDPE, sealed properly and kept at ambient temperature for quality analysis during storage.

Osmotic Dehydration Process

In osmotic dehydration the prepared samples (sweet potato slices) were weighed 500 gm for every experiment and immersed in sucrose solution (30^0Brix and 40^0Brix) contained in a 500

ml glass beaker. The beakers were placed inside the constant temperature water bath. The solution in the beakers were manually stirred at regular intervals to maintain uniform temperature and kept for 120min. The beakers were removed one by one from water bath at designed time, samples were taken out and placed on absorbent paper for 5 minute or were immediately rinsed in flowing water and placed on tissue paper to remove the surface moisture to eliminate excess solution from the surface before weighing. Finally the samples were weighted and their moisture contents were determined.

Determination of moisture content

Moisture of fresh sample was obtained by the standard method (AOAC, 1990). 500 gm fresh sweet potato were weighed in plate and will be keep in the tray dryer at 60°C till constant weight achieved. Moisture divided by initial weight taken will give the moisture content of the fresh sweet potato on wet basis. Moisture content will be determined using the following equation

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

$$M.C\%(db) = \frac{Final\ wt. - initial\ wt.}{Final\ wt.} \times 100 \ldots\ldots\ldots\ldots (ii)$$

Determination of ascorbic acid (mg/100gm)

Ascorbic acid was determined by the procedure proposed by Rangana (1986). Standardization of dye 5 ml of standard ascorbic acid solution was taken and 5 ml of HPO_3 was added. Fill a micro burette with the dye. Titration was done with the dye solution to pink color which should persist for 15 sec. Determination of dye factor i.e. mg of ascorbic acid per ml of the dye, using formula proposed by Rangana (1986).

$$\text{Dye factor} = \frac{0.5}{\text{Titre}} \ldots\ldots\ldots (iii)$$

Ascorbic acid content was calculated for the sample from following equation

$$\text{Ascorbic acid}\,\frac{mg}{100}\,gm = \frac{\text{Titre} \times \text{Dye factor} \times \text{Volume up} \times 100}{\text{Adequate of extract taken for estimation} \times \text{volume of sample}} \ldots\ldots (iv)$$

Determination of pH

PH of samples were determined by digital pH meter. In this method distilled water was taken in a beaker and an electrode of the pH meter was dipped in the distilled water and its reading was set manually to 7. The product was then dissolved in distilled water with the help of pastel and mortal and electrode was dipped in it and then the readings were taken.

Results and Discussion

The proximate analysis includes the study on moisture content, ascorbic acid, and pH of the some-dehydrated sweet potato slices. These were carried out in the department of Food Analysis Laboratory, SVPUAT, and Meerut.

Moisture content

In tray drying for the sample having 2mm slices when immersed in syrup concentration of 30^0B and 40^0B held at 60^0C temperature, and stored for 0, 15, 30, and 45 days respectively it was observed that the highest moisture content 12.16% was found for the untreated sample held at 60^0C for 45 days of storage period and lowest moisture content 6.72% was found for the 40^0 B syrup concentration held at 60^0C before storage, while for the sample having 4mm slices it was observed that the highest moisture content 12.55% was found for the untreated held at 60^0C for 45 days of storage period and lowest moisture content 6.90% was found for the 40^0 B syrup concentration held at 60^0C before storage.

In solar drying, it was observed that the moisture content from the sample for 2 mm slices when immersed in syrup concentration of 30^0B and 40^0B for 0, 15, 30, and 45 days of storage period respectively the highest moisture content 16.32% was found for the untreated sample for 45 days of storage period and lowest moisture content 10.08% was found for 40^0B syrup concentration before storage, while for the sample having 4 mm slices it was observed that the highest moisture content 17.27% was found for the untreated held at 60^0C for 45 days of storage period and lowest moisture content 11.01% was found for 40^0B syrup concentration before storage.

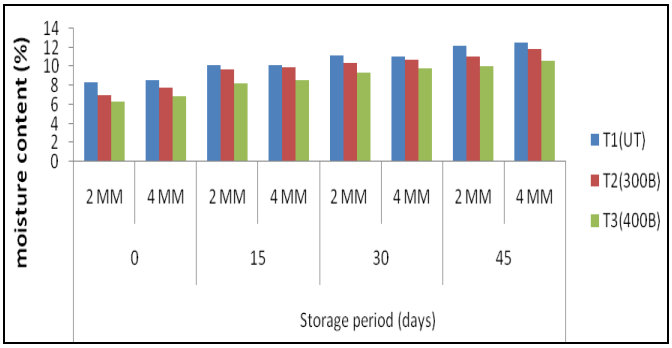

Fig 1: Effect Of Storage Period On Monisture Content Of Osmo-Tray Dried Sweet Potato Slices Having Thikness 2mm And 4mm.

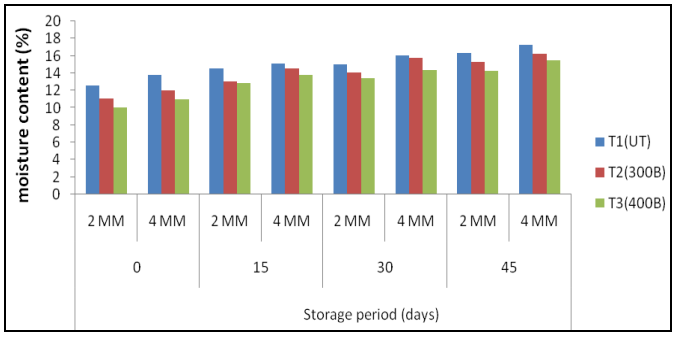

Fig 2: Effect Of Storage Period On Monisture Content Of Osmo-Solar Dried Sweet Potato Slices Having Thikness For 2mm And 4mm.

Ascorbic acid

In tray drying, for the sample having 2mm slices when immersed in syrup concentration of 30 and 40^0B held at 60^0C temperature for 0, 15, 30, and 45 days of storage period respectively It was observed that the maximum ascorbic acid 16.95 mg/100gm was found for the untreated held at 60^0C for 45 days of storage period and minimum ascorbic acid 5.21 mg/100gm was found for 40^0B syrup concentration held at 60^0C before storage (initial stage of storage), while for the sample having 4 mm slices when immersed in syrup concentration of 30^0B and 40^0B held at 60^0C temperature for 0, 15, 30, and 45 days of storage period respectively it was observed from the table that the maximum ascorbic acid 16.82

mg/100gm was found for the untreated held at 60^0C for 45 days of storage period and minimum ascorbic acid 9.44 mg/100gm was found for 40^0B syrup concentration held at 60^0C before storage (initial stage of storage. It was also found that ascorbic acid decreases slightly with the increase of storage period. In solar drying, the sample having 2mm slices when immersed in syrup concentration (30 and 40^0 B) for 0, 15, 30, and 45 days of storage period respectively it was observed from the table that the maximum ascorbic acid 17.88 mg/100gm was found for the untreated for 45 days of storage period and minimum pH content 10.06 mg/100gm was found for 40^0 B before storage (initial stage of storage), while sample having 4 mm slices when immersed in syrup concentration (30 and 40^0 B) for 0, 15, 30, and 45 days of storage period respectively it was observed that the maximum ascorbic acid 17.98 mg/100gm was found for the untreated for 45 days of storage period and minimum pH content 10.88 mg/100gm was found for 40^0 B before storage (initial stage of storage).

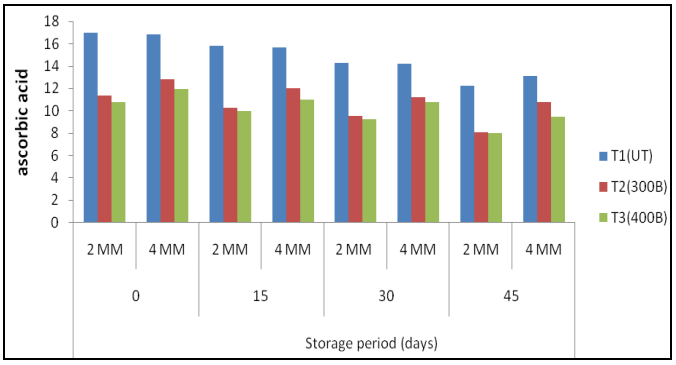

Fig 3: Effect Of Storage Period On Ascorbic Acid Of Osmo-Tray Dried Sweet Potato Slices Having Thikness For 2mm And 4mm.

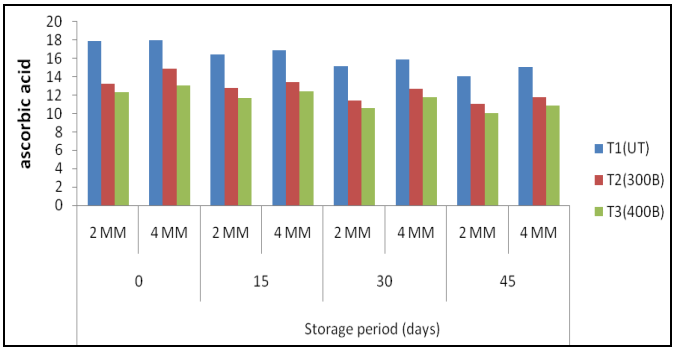

Fig 4: Effect Of Storage Period On Ascorbic Acid Of Osmo Dried Dried Sweet Potato Slices Having Thikness For 2mm And 4mm.

PH

In tray drying, for the sample having 2mm slices when immersed in syrup concentration of 30 and 40^0B held at 60^0C temperature for 0, 15, 30, and 45 days of storage period respectively it was observed that the maximum pH content 6.21% was found for the untreated held at 60^0C for 45 days of storage period and minimum pH content 5.21% was found for 40^0B syrup concentration held at 60^0C before storage (initial stage of storage), while for the sample having 4 mm slices when immersed in syrup concentration of 30 and 40^0B held at 60^0C temperature for 0, 15, 30, and 45 days of storage period respectively it was observed that the maximum pH content 6.36% was found for the untreated held at 60^0C for 45 days of storage period and minimum pH content 5.64% was found for 40^0 B syrup concentration held at 60^0C before storage (initial stage of storage).In solar drying, for the sample having 2mm slices when immersed in syrup concentration of 30 and 40^0B for 0, 15, 30, and 45 days of storage period respectively it was observed that the maximum pH content 6.22% was found for the untreated for 45 days of storage period and minimum pH content 5.93% was found for 40^0B syrup concentration before storage (initial stage of storage), while for the sample having 4 mm slices when immersed in syrup concentration of 30 and 40^0B for 0, 15, 30, and 45 days of storage period respectively it was observed from the table that the maximum pH content 6.46% was found for the untreated for 45 days of storage period and minimum pH content 5.98% was found for 40^0 B syrup concentration before storage (initial stage of storage).

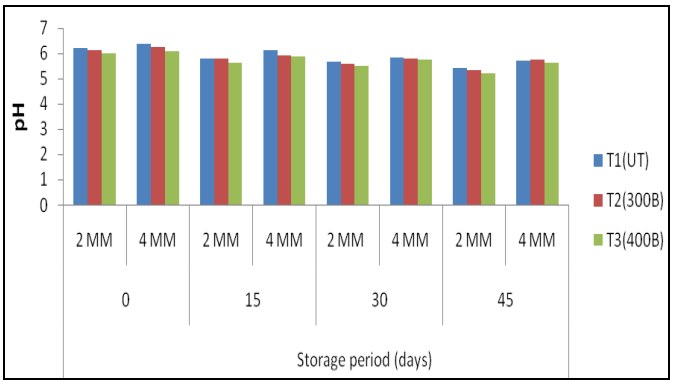

Fig 5: Effect Of Storage Period On Ph Of Osmo-Tray Dried Sweet Potato Slices Having Thikness For 2mm And 4mm.

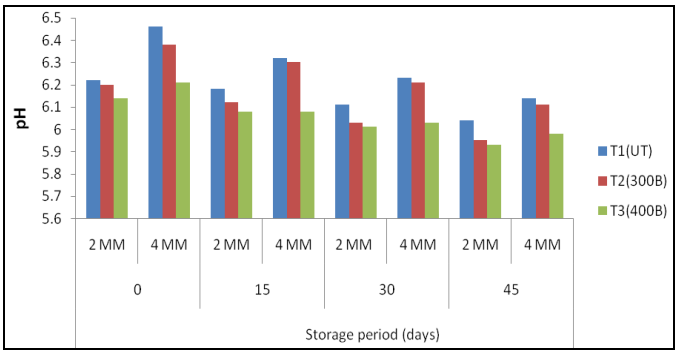

Fig 6: Effect Of Storage Period On pH Of Osmo-Solar Dried Sweet Potato Slices Having Thikness For 2mm And 4mm.

Conclusions

The presence of sugar on the surface of the dehydrated sample is an obstacle for the contact with oxygen thus reducing the oxidative reactions. The moisture content of sweet potato slices decreased with increase in temperature and the concentration of osmotic solution held at 60^0C temperature while moisture content followed a slight increasing trend as the storage period increases. In tray drying**,** the maximum pH content 6.21% was found for the untreated held at 60^0C for 45 days of storage period and minimum pH content 5.21% was found for 40^0 Brix syrup concentration held at 60^0C before storage for 2 mm slices while for 4 mm slices the maximum pH content 6.36% was found for the untreated held at 60^0C for 45 days of storage period and minimum pH content 5.64% was found 40^0 Brix syrup concentration held at 60^0C before storage. In solar drying**,** the maximum pH content 6.22% was found for the untreated held at 60^0C for 45 days of storage period and minimum pH content 5.93 % was found for 40^0 Brix syrup concentration held at 60^0C before storage for 2 mm slices while for 4 mm slices the maximum pH content 6.46% was found for the untreated held at 60^0C for 45 days of storage period and minimum pH content 5.98% was found 40^0

Brix syrup concentration held at 60^0C before storage**.** In tray drying**,** the maximum ascorbic acid 16.95 mg/100gm was found for the untreated held at 60^0C for 45 days of storage period and minimum pH content 8.02 mg/100gm was found for 40^0 Brix syrup concentration held at 60^0C before storage for 2 mm slices while for 4 mm slices the maximum ascorbic acid 16.82 mg/100gm was found for the untreated held at 60^0C for 45 days of storage period and minimum ascorbic acid 9.44 mg/100gm was found for 40^0 Brix syrup concentration held at 60^0C before storage. In solar drying, the maximum ascorbic acid 17.88 mg/100gm was found for the untreated held at 60^0C for 45 days of storage period and minimum pH content 10.06 mg/100gm was found for 40^0 Brix syrup concentration held at 60^0C before storage for 2 mm slices while for 4 mm slices the maximum ascorbic acid 17.98 mg/100gm was found for the untreated held at 60^0C for 45 days of storage period and minimum ascorbic acid 10.88 mg/100gm was found for 40^0 Brix syrup concentration held at 60^0C before storage.

References

1. AOAC. (Association of Official Analytical Chemists). *Official Methods of Analysis***.** 14ªed. Arlington, 1990.
2. Cnph. Embrapa - Empresa Brasileira de Pesquisa Agropecuária. http://www.cnph.embrapa.br/cultivares/batdoce.html. 10 de junho de, 2002.
3. Hough G, Chirife J, Marini CA. A simple model for osmotic dehydration of apples. *Lebensmittel Wissenschaft und Technologie*, 1993; 26:151-156.
4. Kowalska H, Lenart A. Mass exchange during osmotic pretreatment of vegetables. Journal of Food Engineering. 2001; 49:137-140.
5. Park KJ, Bin A, Brod FPR, Park THKB. Osmotic dehydration kinetics of pear D'anjou (*Pyrus communis* L.). Journal of Food Engineering, 2002; 52:293-298.
6. Ranganna S. Handbook of Analysis and Quality Control for Fruits and Vegetable Products. Tata McGraw Hill, New Delhi, 1986.
7. Rastogi NK, Raghavarao KSMS. Mass transfer during osmotic dehydration of pineapple: considering Fickian diffusion in cubical configuration. *Lebensmittel Wissenschaft und Technologie*, 2004; 37:43-47.
8. Raoult-Wack AL, Lenart A, Guilbert S. recent advances in the osmotic dehydration of food. *Trends in Food Science & Technology*, 1994; 5l:225-260.
9. Torreggiani D, Bertolo G. Osmotic pré-treatments in fruit processing: chemical, physical and structural effects. Journal of Food Engineering. 2001; 49:247-253.