International Journal of Chemistry Studies
ISSN: 2581-348X
Impact Factor: RJIF 5.44
www.chemistryjournal.in
Volume 2; Issue 2; March 2018; Page No. 41-43

Drying characteristics of carrot and beetroot by application of different Drying techniques

[*1] P Shylaja, [2] Girija Vudugula, [3] V Bhasker, [4] Srinivas Maloo

[1, 2] M.Tech of Food Technology, Department of Food Technology, University College of Technology, Osmania University, Hyderabad, Telangana, India

[3] Assistant Professor of Food Technology, Department of Food Technology, University College of Technology, Osmania University, Hyderabad, Telangana, India

[4] Associate Professor of Food Technology, Department of Food Technology, University College of Technology, Osmania University, Hyderabad, Telangana, India

Abstract
Drying is one of the oldest methods of food preservation. During drying moisture from the food product is evaporated thus facilitate lack of moisture for growth of microorganisms. As already known moisture is responsible for every chemical and microbiological changes in food. By controlling the moisture content in food, can reduce the adverse effects in food. To reduce the moisture content in food, Drying is best method to achieve this goal. The present study was carried over on drying behavior of selected vegetables during different types of drying methods. In this study carrot and beetroot was taken. These vegetables were dried in three drying methods such as tray, solar and infrared drying.

Keywords: carrot, beetroot, tray drying, infrared drying, desired moisture content

1. Introduction

Drying also reduces the weight of the food product. Shrinkage, which occurs often during drying, reduces the volume of the product. These changes in weight and volume can lead to substantial savings in transport and storage costs and, in some cases, the costs of packaging. However, dehydration is an energy intensive process and the cost of supplying this energy can be relatively high, compared to other methods of preservation. Changes detrimental to the quality of the food may also occur during drying. In the case of solid food pieces, shrinkage can alter the size and shape of the pieces. Changes in colour may also occur. When the food pieces are rehydrated, their colour and texture may be significantly inferior to those of the fresh material. Dry powders may be slow to rehydrate. Changes in flavor may occur during drying solid or liquid foods, as a result of losing volatile flavour compounds and/or the development of cooked flavours. A reduction in the nutritional value of foods can result from dehydration. In particular, loss of vitamins C and A may be greater during drying than in canning or freezing.

Dehydration is usually described as a simultaneous heat and mass transfer operation. Sensible and latent heat must be transferred to the food to cause the water to evaporate. Placing the food in a current of heated air is the most widely used method of supplying heat. The heat is transferred by convection from the air to the surface of the food and by conduction within the food. Alternatively, the food may be placed in contact with a heated surface. The heat is transferred by conduction to the surface of the food in contact with the heated surface and within the food. There is limited use of radiant, microwave and radio frequency energy in dehydration. Freeze drying involves freezing the food and removal of the ice by sublimation. This is usually achieved by applying heat, by conduction or radiation, in a very low pressure environment. In osmotic drying food pieces are immersed in a hypertonic solution. Water moves from the food into the solution, under the influence of osmotic pressure.

1.1 Types of drying

For the present study three methods of drying was used.

1. Tray drying
2. Solar drying
3. Infrared drying

2. Materials and Method

The raw materials for this study was collected from local super market.

2.2 Materials

1. Carrot
2. Beetroot

2.3 Method

The vegetables were cleaned and sliced for uniform thickness using slicer. Then vegetables were dried in tray, solar and infrared dryer. Moisture content of the product can be determined by standard Ranganna method.

2.4 Process flowchart

Collection of vegetables
↓
Cleaning of vegetables with normal water to remove dust particles on surface of vegetables
↓
Analysis of initial moisture percentage by hot air oven method
↓
Slicing of vegetables for uniform thickness using slicer
↓
Drying of vegetables at constant temperature and time (45 to 50◦c) by tray, solar and infrared dryers.
↓
Analysis of final moisture content of dried product after drying

Fig 1: Process flow sheet of drying

3. Results

The vegetables were analyzed for moisture content for every hour in order to calculate the rate of removal of moisture from the product. Vegetables were analyzed for initial and final moisture content before and after drying.

3.1 Beetroot drying

Table 1

Time, hr	Moisture Percent	
	Tray drying	Solar drying
0	86	86
1	75	80
2	52	75
3	45	63
4	33	58
5	21	46
6	11	39
7	10	24
8		19
9		16
10		13
11		12
12		11
13		10

The above table shows drying of beetroot in solar and tray dryer. For infrared drying it take 10 min to reach the require moisture content in the finished product.

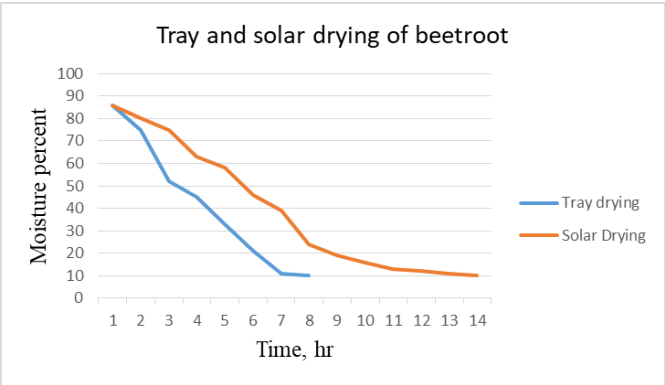

Fig 2: Drying curves of beetroot during tray and solar drying

3.2 Carrot drying

Table 2

Time, hr	Moisture Percent	
	Tray drying	Solar drying
0	88	88
1	77	81
2	59	77
3	48	65
4	36	57
5	25	43
6	18	36
7	12	28
8	10	20
9		18
10		14
11		12
12		10

The above table shows drying of carrot in solar and tray dryer. For infrared drying it take 8 min to reach the require moisture content in the finished product.

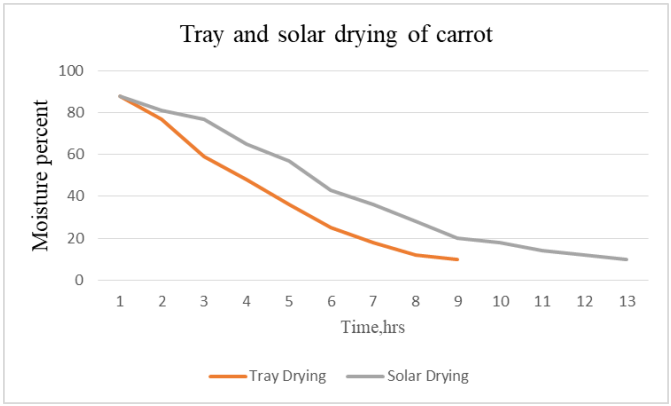

Fig 5: Drying curves of carrot during tray and solar drying

4. Conclusions

Beetroot and carrot were dried in tray, solar and infrared drying. For beetroot drying, tray dryer took 7 hours to achieve required moisture content, solar drying took 13hrs and infrared dryer took only 10min. For carrot drying, tray dryer took 8 hours to achieve required moisture content, solar drying took 12hrs and infrared dryer took only 8min. In both cases infrared dryer shows less time for drying. Hence infrared dryer suitable for faster rate of evaporation from products. Drawback of infrared drying is high initial cost. If consider cost wise solar drying is cheap among three dryers. Drawback of solar dryer is poor quality of finished products comparatively tray dryer. Hence concluded that tray drying of vegetables was preferable for drying.

5. References

1. Food Processing HandbookEdited by James G. Brennan.
2. Handbook of Analysis and Quality Control for Fruit and Vegetable Products second edition by S. Ranganna, 1986.
3. 3.Infrared drying of food products by GrdzelishviliG., Hoffman P., Czech Technical University in Prague,

Department of Process Engineering, Technická 4, 166 07 Prague, Czech Republic; tel.: +420 224352714.
4. 4.Solar Drying—A Sustainable Way of Food Processing by M.A. Aravindh and A. Sreekumarwww.springer. com/978-81-322-2336-8.