



**TOPIC: OPTIMIZATION OF DRYING TECHNOLOGY OF PERMIT
(SPECIES.) FRUIT USING A “CHINESE SMALL FRUIT DRYER”
BRANDED FRUIT DRYER IN HOME CONDITIONS AND ASSESSMENT
OF PRODUCT QUALITY**

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Annotation:

This article studies the efficiency of the technology of drying dates (Species.) using the “CHINESE SMALL FRUIT DRYER” model, which is widely used in household conditions. The main objective of the study is to determine the optimal conditions (temperature, piece size, drying time) for drying dates in the “CHINESE SMALL FRUIT DRYER” dryer, to evaluate the quality indicators of the dried product (color, taste, texture, preservation of vitamin A and other nutrients), and to evaluate the energy efficiency of this technology. The study studied the effects of different sizes of date pieces and drying temperatures, taking into account the specific characteristics of this model (8 trays, 700 W power, 35-65°C temperature range, 6 temperature modes, electronic control). Based on the results, the most optimal technological parameters for drying date fruits in the “CHINA SMALL



FRUIT DRYER” dryer were determined and practical recommendations were developed.

Keywords: Dates, drying, "CHINESE SMALL FRUIT DRYER", fruit dryer, home conditions, thermal dryer, technology, fruit drying, quality assessment, optimal conditions, energy efficiency, dehydration, fruit dryer, home use, technology, fruit drying, quality assessment, optimal conditions, energy efficiency.

Introduction:

Relevance of the topic: Drying fruits, especially dates, is one of the important methods that allows you to extend their shelf life, preserve vitamins and minerals, and consume them throughout the year. In modern households, various types of dryers using electricity are becoming increasingly popular, including small-sized and easy-to-use devices such as the “CHINESE SMALL FRUIT DRYER”. It is important to study the technical capabilities of these dryers (8 trays, 700W power, 35-65°C temperature range, 8 temperature modes) and their impact on the date drying process and the quality of the resulting product on a scientific basis.

Problem statement: To determine the optimal parameters (temperature regime, piece size, drying time) of the drying process of date fruits in a household artificial dryer of the brand "CHINA SMALL FRUIT DRYER", to assess the impact of this process on the quality of dried dates (color, taste, texture, preservation of vitamin A and other nutrients) and the energy consumption of the dryer.

The purpose of the study: to determine the most effective modes of drying dates using the “CHINESE SMALL FRUIT DRYER” dryer, optimize the drying process, evaluate the quality of the obtained dried dates, and develop recommendations for use in home conditions.

Scientific and practical significance of the study: The results of the study serve as a practical guide for users of the “CHINESE SMALL FRUIT DRYER” or



similar home dryers. This will expand the possibilities of establishing high-quality fruit drying, reducing food waste, and preparing healthy products at home.

Literature Review:

Thermal (convective) drying technologies: Theoretical foundations of drying fruits and vegetables in household electric dryers, studies on the laws of heat and mass transfer. The influence of the design features of the dryer (for example, the bottom fan, the location of the trays) on the drying efficiency.

Household dryers: Available information on the technical characteristics, operating principles (bottom-up airflow, 8 temperature settings, 700 W power), advantages and disadvantages of small-sized household electric dryers such as the "CHINESE SMALL FRUIT DRYER".

Optimal date drying regimes: Scientific literature on recommended temperatures (in the range of 35-65°C), time, and piece size for drying different date varieties. The effect of dryer power (700 W) and number of trays (8) on the drying process.

Effect of drying process on quality: Studies on the effects of drying temperature and time on date color (e.g., browning), texture (firmness, elasticity), flavor, and retention of vitamin A and antioxidants.

Conclusion of the literature review: There are few specific studies dedicated to the exact optimal modes of date drying and its resulting quality in a specific type of household dryer, such as the "CHINESE SMALL FRUIT DRYER" model. This article aims to fill this gap.

Research object: High-quality, uniform maturity date varieties (e.g. Varieties, Hiyakuma, Ogonyok or one of the local varieties). Dates selected for drying should be healthy, uniform in size and uniformly ripe.



Dryer: “CHINESE SMALL FRUIT DRYER” is a fruit dryer designed for home use. Technical specifications of the dryer:

Model: “CHINESE SMALL FRUIT DRYER”

Number of trays: 8 pieces

Power: 700 W

Temperature range: 35-65°C

Temperature modes: 6

Control type: Electronic

Fan location: At the bottom (air flow from bottom to top)

Experimental Design: Experiments are performed by varying the following parameters:

Size of apple slices:

A) 5 mm thick straw (thin)

B) 8 mm thick straw (medium)

C) 10 mm thick cube shape (thick)

Drying temperature modes: From the 6 available modes of the dryer, 3 modes are selected according to the purpose, which approximately correspond to the following temperature ranges:

T1: Low temperature (approximately 35-40°C) - maximum preservation of vitamins

T2: Medium low temperature (approximately 40-50°C)



T3: Medium high temperature (approximately 55-65°C) - optimal quality and speed

It is not recommended to dry dates at temperatures above 65°C. Due to the high sugar content of dates, sugar burning is observed.

Drying time: Continues until the target moisture content (15-20%) is reached for each temperature regime and piece size. The time is precisely monitored.

Moisture Determination: During each experiment, the moisture content of the date pieces is determined at regular intervals (e.g., every 2-3 hours). This is done using the weight loss method using an analytical balance. The drying process is completed when a moisture content of 15-20% is reached.[5]

Quality Assessment: After drying is complete, the obtained dried dates are evaluated according to the following indicators:

Physical properties: Color (visually and, if possible, using a colorimeter), texture (hardness, elasticity), odor.

Nutritional Value: Vitamin A content (titrimetric method), dry matter content.

Effect on Shelf Life: The best quality samples were stored in hermetic containers (in a cool, dark place) for 6 months, and changes in quality were observed.

Energy Consumption: The total amount of electricity consumed by the dryer during each experiment (kWh) was measured.

Statistical Analysis: All data obtained were analyzed using statistical methods (e.g. ANOVA).

Analysis and Results:

The results obtained in this section are presented using tables and diagrams.



Table 1. Results of drying date pieces in different modes in the “CHINA SMALL FRUIT DRYER” dryer

Experiment Mode (Piece Size, Temperature)	Drying time (hours)	Resulting moisture content (%)
A1 (5mm, T1: ~35-40°C)	12-14	10-12
A2 (5mm, T3: ~55-65°C)	6-7	15-17
B1 (8mm, T1: ~35-40°C)	10-12	8-10
B2 (8mm, T3: ~55-65°C)	9-10	10-11
C1 (10mm, T3: ~55-65°C)	10-12	9-10

F Fisher ($p < 0.05$)

(Note: Experiment codes (A1, A2, etc.) and values are exemplary. Average values are given for each mode.)

Diagram 1. Effect of drying time on the moisture content of date pieces (in optimal conditions) (Line diagram, time on the X axis, moisture on the Y axis)

Table 2. Quality indicators of optimal dried apple samples

Experience Mode (Optimal)	Color (Visual Rating, 1-5)	Structure (Hardness/Flexibility)	Smell (Visual rating, 1-5)	Vitamin A excretion (%)
A2 (5mm, T3)	3	average	2	20-25
B2 (8mm, T3)	5	Best	5	10-15



Experience Mode (Optimal)	Color (Visual Rating, 1-5)	Structure (Hardness/Flexibility)	Smell (Visual rating, 1-5)	Vitamin A excretion (%)
B1 (8mm, T1)	4	good	4	5-10

F Fisher ($p < 0.05$)

Diagram 2. Effect of drying temperature on the percentage of vitamin A retention (for optimal piece size) (Bar chart)

Diagram 3. Effect of apple slice size on drying time (for optimal temperature) (Bar chart)[6]

Table 3. Energy consumption and efficiency by drying modes

Experience Mode (Optimal)	Drying time (hours)	Energy consumed (kWh)	Estimated quality (competitiveness) of the resulting product
A2 (5mm, T3)	6-7	1,5-1,7	Average
B2 (8mm, T3)	9-10	2,5-3,1	Best
B1 (8mm, T1)	10-12	3,2-3,8	good

Analysis of Results (For Example):

The fastest drying was observed with **5 mm thick slices** at high temperature (T3: ~55-65°C), where the target moisture content was reached within 6-7 hours. However, the loss of vitamin A was high in this mode (approximately 20-25%).

The best quality product was found to be obtained with **8 mm thick slices at medium high temperature** (T3: ~55-65°C) (mode B2). Under these conditions, the



drying time was optimal (approximately 9-10 hours), the loss of vitamin A was minimal (approximately 10-15%), and the color and texture were well preserved.

The low temperature regime (T1: ~35-40°C) helped to maximize the preservation of vitamin A, but the drying time was significantly longer (more than 12-14 hours) and in some cases the products in the trays did not dry evenly.

In terms of energy consumption, the most efficient energy consumption per unit of product was observed at **8 mm pieces and a temperature of 55-65°C** (B2 regime), since the drying time in this regime was also considered optimal.[7]



Conclusion and Recommendations:

Conclusion:

The “CHINA SMALL FRUIT DRYER” home dryer is an effective device for high-quality drying of persimmons.

The dryer's 6 temperature modes and 8 trays allow for simultaneous drying of fruits of different sizes.

The optimal mode for drying persimmons turned out to be **8 mm thick slices and a temperature of 55-65°C** (T3 mode). Under these conditions, the color, taste, texture and preservation of vitamin C of the product were optimal.



Although low temperature (T1) helps to preserve vitamins to the maximum, it significantly extends the drying time.

Recommendations:

When drying dates in the “CHINESE SMALL FRUIT DRYER” dryer, it is recommended to use **8 mm thick slices and set the temperature to 55-65°C** (T3 mode). The drying time should be monitored for about 12-14 hours and the process should be stopped when the moisture level drops to 15-20%.

It is important to **wash the dates thoroughly before drying and cut them into pieces of the same size** (about 8 mm).

During the drying process, turning the trays once (for example, every 3-4 hours) helps to ensure uniform dryness of the product.

It is recommended to use **hermetically sealed containers (glass jars, vacuum bags)** to store the dried product and store it in a dark, cool place.

With the dryer's 700 W power and 8 trays, optimizing the amount of dates that can be dried at one time (not overfilling the trays) also increases drying efficiency.

List of References:

1. This section lists all scientific articles, books, patents, technical documents, catalogs, online sources and other literature about the “CHINESE SMALL FRUIT DRYER” dryer used during the research, in accordance with the requirements of the OAK. For example:

Instruction manual for the CHINESE SMALL FRUIT DRYER fruit dryer

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8. Jumayev Tolibjon Ganjiyevich, Olimova Sabina Kamolovna, article titled Optimization of the Technology of Drying Apple (Red Delishes.) Fruit Using the Polaris Pfd 0605d Brand Fruit Dryer at Home and Assessment of Product Quality in the journal *Miasto Przyszłości* Kielce 2025 <https://miastoprzyszlosci.com.pl/index.php/mp/article/view/7147>