



Leosmak Cookbook



Studies prove that freeze drying
of food keeps its all nutrients and
taste even

up to 25 years





Quick start

Food preservation



- On average, food contains **60–70%** of **water**.
- If to remove the whole water from the food, **no bacteria, fungi** and **other pathogens** could develop in the food, spoiling it.
- Freeze drying allows you to maintain almost all nutritional values, **vitamins, proteins** – without high temperature destroying the food.
- If properly sealed (i.e. in mylar bags that have high barrier for the air), completely dried food can be stored in room temperature even for **8–25 years**.

Sublimation principles

Water is a very interesting substance, which has many fabulous properties. **Sublimation** is what happens to the water naturally **high in the mountains**, where low pressure is a reason for the ice to sublimate.

In low pressure conditions (below 611 Pa):

- ice does not melt even if heated to high temperatures,
- ice sublimates changing into vapor, omitting liquid stage,
- water vapor will „stick“ to the coldest place in the environment, de-sublimating again into ice.



Quick start

Your freeze dryer repeats conditions to use these amazing water properties.

The major task for the freeze dryer would be to:

- decrease the pressure: it should be below **611 Pa** for the **sublimation** to happen,
- either freeze (in **freezing**) or heat (in **sublimation**) the product to control its temperature,
- decrease the ice condenser circuits temperature to catch the water **vaporised** from the product.

That is why we need to monitor three parameters during the work of the freeze dryer:

1. **Temperature of the shelves** (which will eventually be the same for your product),
2. **Pressure level,**
3. **Temperature of the traps.**



Phase	Recommended shelves temperature, °C	Traps temperature, °C	Pressure, Pa
Starting point	Room temperature	Room temperature	~ 101 325*
Freezing	-25 or less	Irrelevant	~ 101 325*
Sublimation	<= +40	<= -30	~ 150, ±150
Secondary drying	<= +40	<= -30	~ 150, ±150

*normal atmospheric pressure at the sea level



Vegetables

Product	Size (cm)	Freezing (h)	Sublimation (h / °C)	Drying (h / °C)	Total (h)	Humidity (%)	Residual weight (%)
Beetroot	0,2 - 0,4	4 h	20 h / 40°C	6 h / 40°C	30 h	1,9	10,5-12,0
Carrot	0,3 - 0,5	4 h	10 h / 40°C	6 h / 40°C	20 h	1,9	10,5-12,0
Parsley Root	0,3 - 0,5	4 h	10 h / 40°C	6 h / 40°C	20 h	1,1	9,5-11,5
Sauercrout	0,3 - 0,5	4 h	20 h / 40°C	6 h / 40°C	30 h	2,9	10,5-11,0
Sprouts	0,3 - 0,5	4 h	9 h / 40°C	1 h / 40°C	14 h	0,9	9,5-11,0
Tomatoes	0,4 - 0,7	4 h	10 h / 40°C	6 h / 40°C	20 h	2,4	10,0-12,5





Fruits

Product	Size (cm)	Freezing (h)	Sublimation (h / °C)	Drying (h / °C)	Total (h)	Humidity (%)	Residual weight (%)
Apples	0,3 - 0,5	4 h	20 h / 40°C	6 h / 40°C	30 h	3,3	10,0-13,0
Avocado	0,3 - 0,5	4 h	10 h / 40°C	6 h / 40°C	20 h	0,3	9,0-11,0
Bananas	0,3 - 0,5	4 h	30 h / 40°C	6 h / 40°C	40 h	2,2	12,5-13,5
Peaches	0,3 - 0,5	4 h	20 h / 40°C	6 h / 40°C	30 h	2,7	10,5-12,5
Pineapple	0,3 - 0,5	4 h	20 h / 40°C	6 h / 40°C	30 h	1,2	9,5-11,5
Raspberries	0,3 - 0,5	4 h	30 h / 40°C	6 h / 40°C	40 h	2,1	8,5-10,0
Strawberries	0,3 - 0,5	4 h	30 h / 40°C	6 h / 40°C	40 h	2,2	9,5-11,5



Meat

Product	Size (cm)	Freezing (h)	Sublimation (h / °C)	Drying (h / °C)	Total (h)	Humidity (%)	Residual weight (%)
Chicken Liver	0,7 - 1,5	4 h	9h / 40°C	-	13 h	2,9	27,0-28,5
Meat (Beef)	0,5 - 1,0	4 h	20 h / 40°C	6 h / 40°C	30 h	2,5	25,5-27,0
Meat (Turkey)	0,5 - 1,0	4 h	10h / 40°C	6 h / 40°C	20 h	1,4	26,0-29,0



Dairy



Product	Size (cm)	Freezing (h)	Sublimation (h / °C)	Drying (h / °C)	Total (h)	Humidity (%)	Residual weight (%)
Cottage Cheese	-	4 h	10 h / 40°C	6 h / 40°C	20 h	0,1	11,5-13,5
Ice cream (shelves cooling down)	-	4 h	20 h / 40°C	6 h / 40°C	30 h	0,9	12,5-13,0
Milk 3.2% (Lactose Free)	-	4 h	20 h / 40°C	6 h / 40°C	30 h	2,9	8,0-10,0
Mozzarella	-	4 h	20 h / 40°C	6 h / 40°C	30 h	1,4	10,0-12,0



Candies*

**sweet mode*

Product	Size (cm)	Preheating (°C)	Vaporization (h / °C)	Cooling (h / °C)	Humidity (%)
Chocolate bar with peanuts and caramel	0,5 - 1,0	54 °C	1,5 h / 54°C	Auto mode	0,5
Rainbow candies	-	52 °C	2 h / 40°C	Auto mode	0,1





Drinks

Product	Size (cm)	Freezing (h)	Sublimation (h / °C)	Drying (h / °C)	Total (h)	Humidity (%)	Residual weight (%)
Coffee	-	4 h	10 h / 40°C	6 h / 40°C	20 h	0,1	8,0-10,5
Juice (with the exception of cranberry and lemon juice)	-	4 h	20 h / 40°C	6 h / 40°C	20 h	0,7	7,5-9,5





Herbs & microgreens

Product	Size (cm)	Freezing (h)	Sublimation (h / °C)	Drying (h / °C)	Total (h)	Humidity (%)	Residual weight (%)
Broccoli sprouts	-	4 h	20 h / 40°C	6 h / 40°C	30 h	1,2	8,0-10,0
Leek sprouts	-	4 h	20 h / 40°C	6 h / 40°C	30 h	1,1	5,0-8,0
Radish sprouts	-	4 h	20 h / 40°C	6 h / 40°C	30 h	0,9	7,0-10,0
Spearmint	-	4 h	9 h / - 5°C	2 h / 40°C	15 h	1,9	9,0-11,0



Flowers



Product	Size (cm)	Freezing (h)	Sublimation (h / °C)	Drying (h / °C)	Total (h)	Humidity (%)	Residual weight (%)
Decorative flowers	-	4 h	30 h / 20°C	2 h / (-5°C/20°C)	26 h	0,5	25,0-35,0
Edible flowers	-	4 h	20 h / 20°C	2 h / 20°C	26 h	0,3	10,5-12,5



Disclaimer

The information provided in this cookbook is for reference purposes only and is based on test cycles performed under controlled conditions using our freeze dryers. The recommended parameters (freezing time, sublimation time and temperature, drying time and temperature) may not produce identical results in every setting.

The final outcome of the freeze-drying process depends on numerous factors beyond our control, including but not limited to:

- ambient humidity and room temperature,
- the method and duration of loading the freeze dryer,
- the size, shape, and ripeness of the product,
- how evenly the product is distributed in the chamber,
- the speed and method of post-cycle packaging.

Therefore, Leosmak Ltd. cannot be held responsible for any variations in the final results that may occur when using the suggested parameters. We recommend conducting your own tests and adjusting the cycles to fit your specific product and operating conditions.

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