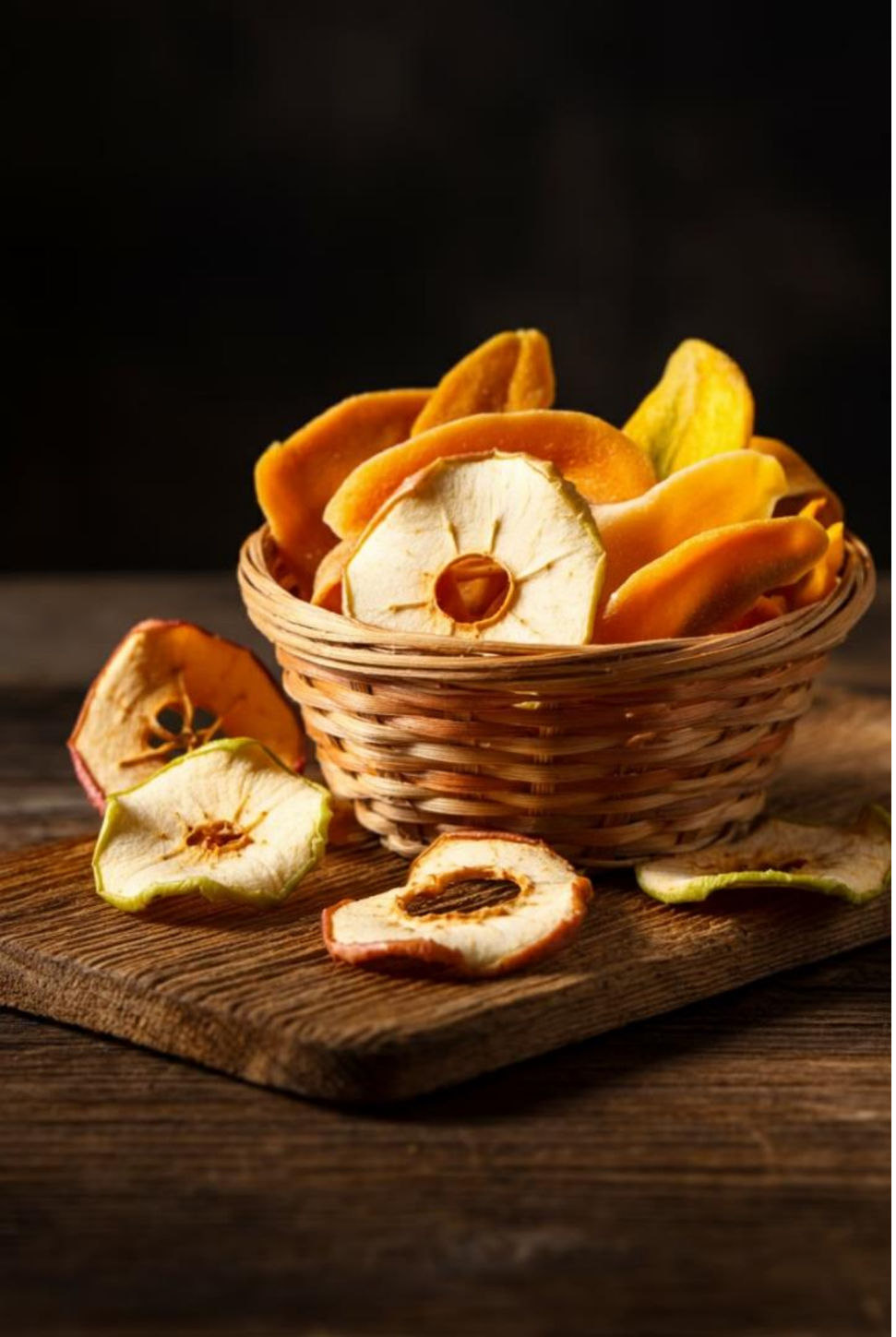


Drying Fruits: Color Retention, Shelf Life, and Spoilage

Explore the impact of citric acid treatment on color retention during fruit drying. Learn about shelf life extension and spoilage prevention for dried apples and mangoes.

Materials Needed

Equipment

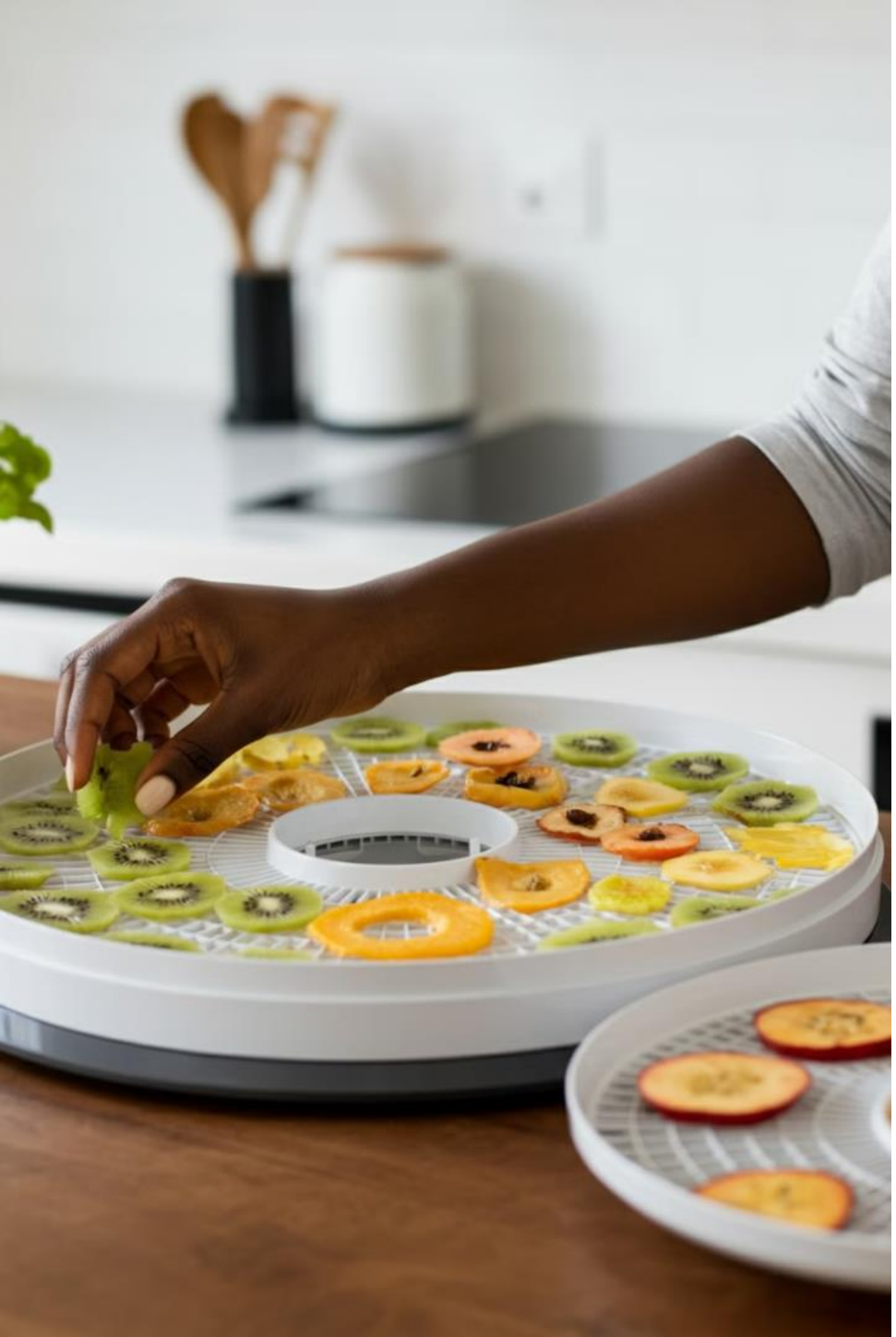
- Air dryer (Dehydrator)
- Drying racks
- aW-meter

Tools

- Bowl
- Cutting board & knife

Ingredients

- 2 green apples
- 1–2 mangos
- Citric acid solution (0.1% W/W)



Step-by-Step Process

1

Preparation

Peel and slice mangoes. Wash and slice apples thinly.

2

Preventing Browning

Dip slices in 0.1% citric acid solution to inhibit Polyphenol Oxidase (PPO) activity.

3

Drying Process

Arrange on racks. Dry mangoes 8-12 hours, apples 6-10 hours at 40-60°C.

4

Measuring Water Activity

Use aW-meter. Fresh apple: aW ≈ 0.908. Dried apple: aW = 0.60 to 0.70.

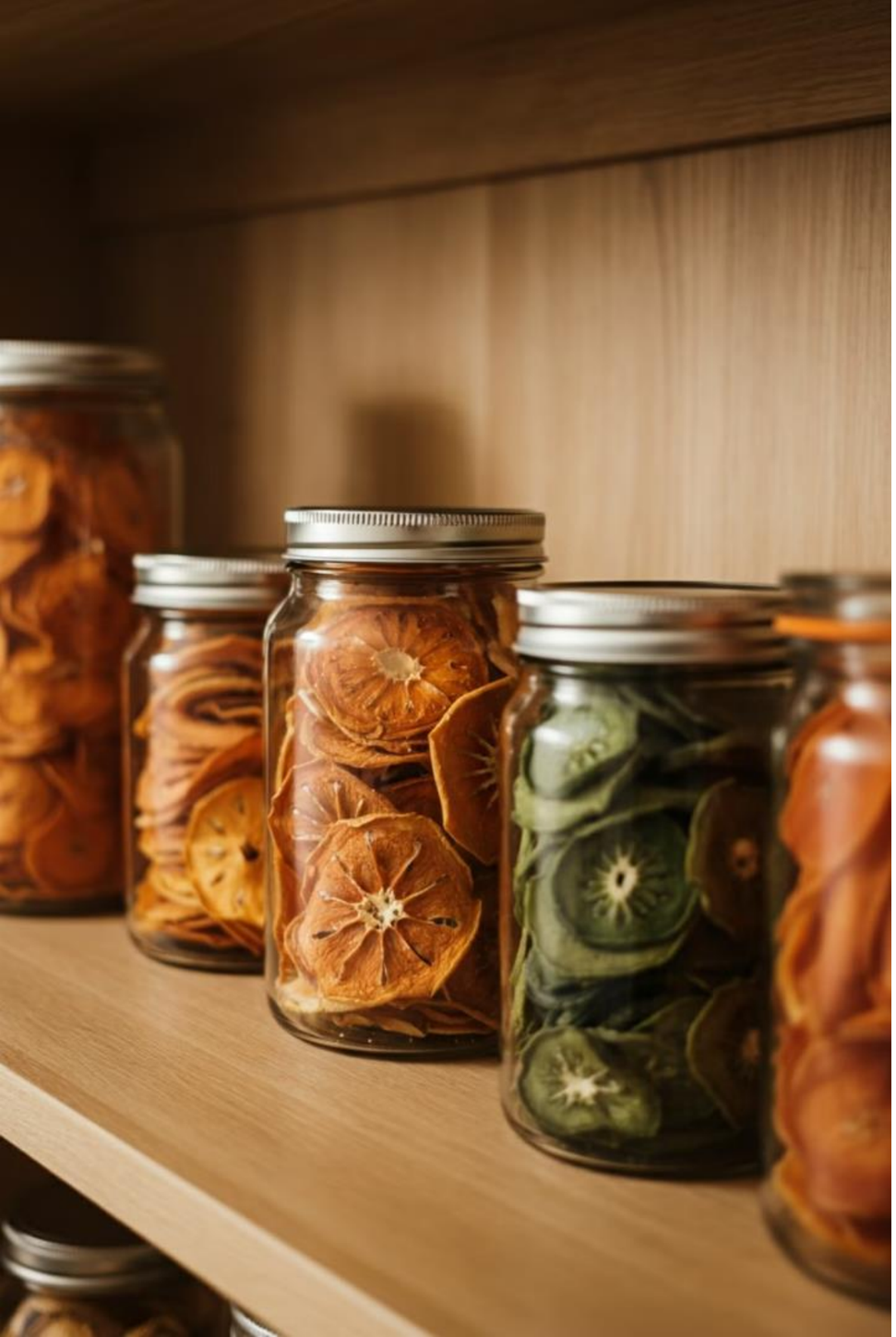
Color Retention: Untreated vs Treated Fruits

Untreated Fruits

Prone to enzymatic browning due to PPO activity. May develop brown or yellow hues. Visual appearance deteriorates, reducing consumer appeal.

Citric Acid–Treated Fruits

Retain natural color better. Apples maintain lighter appearance. Mangoes keep vibrant orange-yellow color. Enhanced sensory appeal and overall quality during storage.



Shelf Life of Dried Fruits

Unopened Shelf Life

6-12 months without refrigeration when stored properly. Optimal aW-values (0.60–0.70) inhibit microbial growth while maintaining texture.

Opened Shelf Life

1-3 months once opened. Use desiccants to prevent moisture absorption.

Storage Conditions

Store in airtight containers in a cool, dark place. Maintain proper water activity levels.

Spoilage Risks

Mold Growth

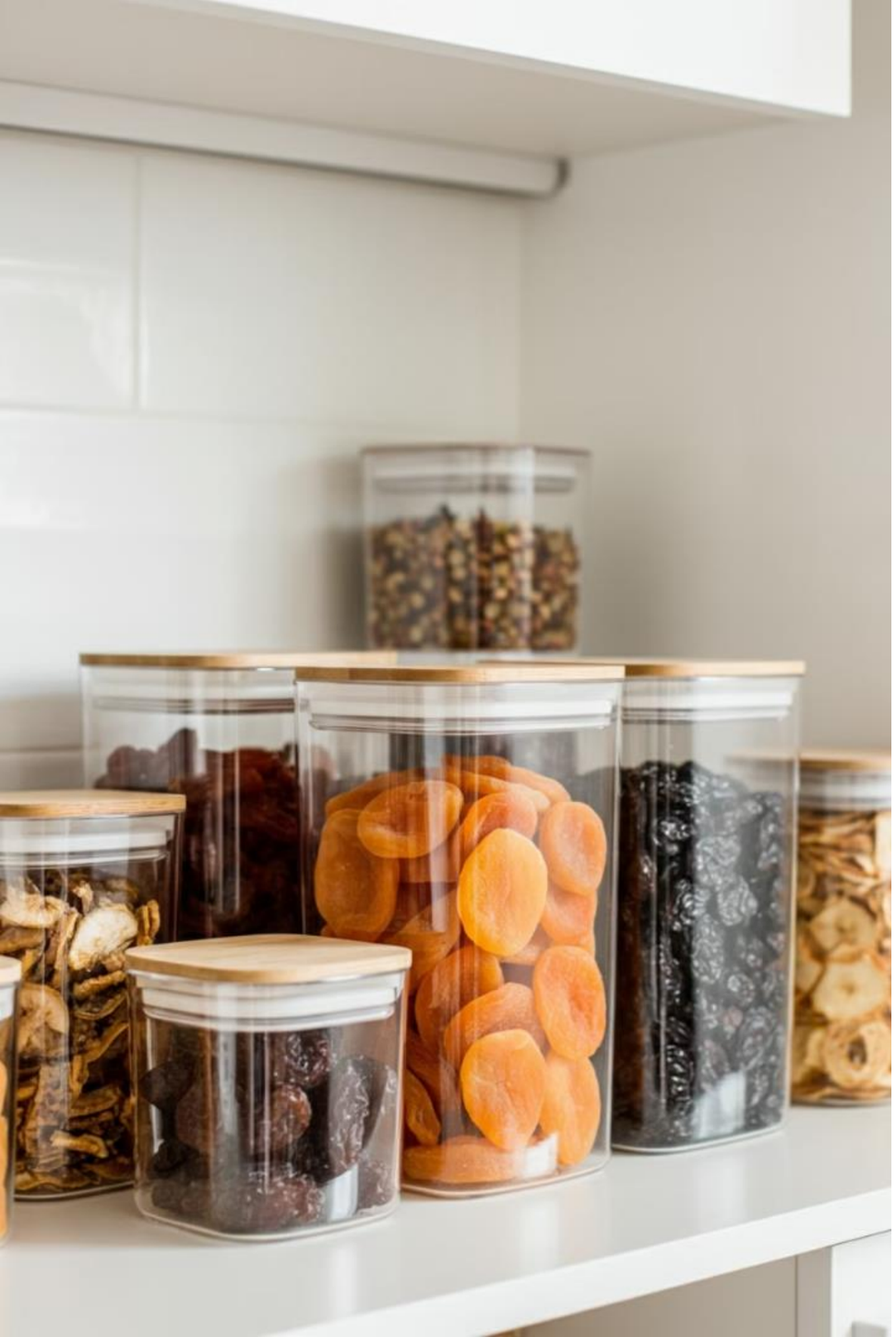
Can occur if moisture reabsorbs into improperly sealed containers.

Texture Changes

Exposure to humidity can cause dried fruits to become sticky or rehydrate partially.

Flavor Loss

Oxidation during storage may lead to off-flavors.



Preventing Spoilage

1

Optimal Drying

Ensure fruits are fully dried to reach optimal aW-values (0.60–0.70).

2

Proper Storage

Use airtight containers with desiccants or vacuum-sealed packaging.

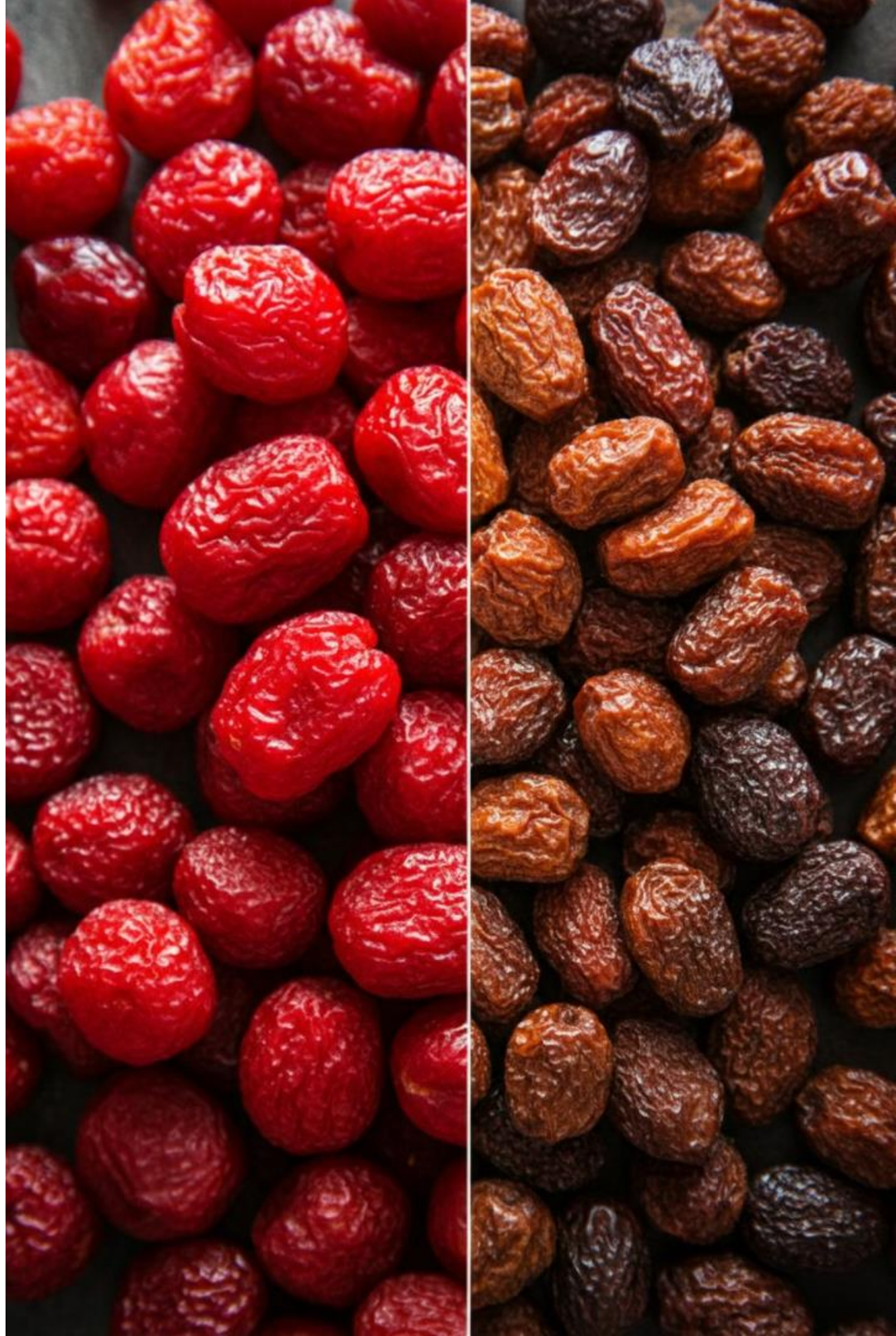
3

Environmental Control

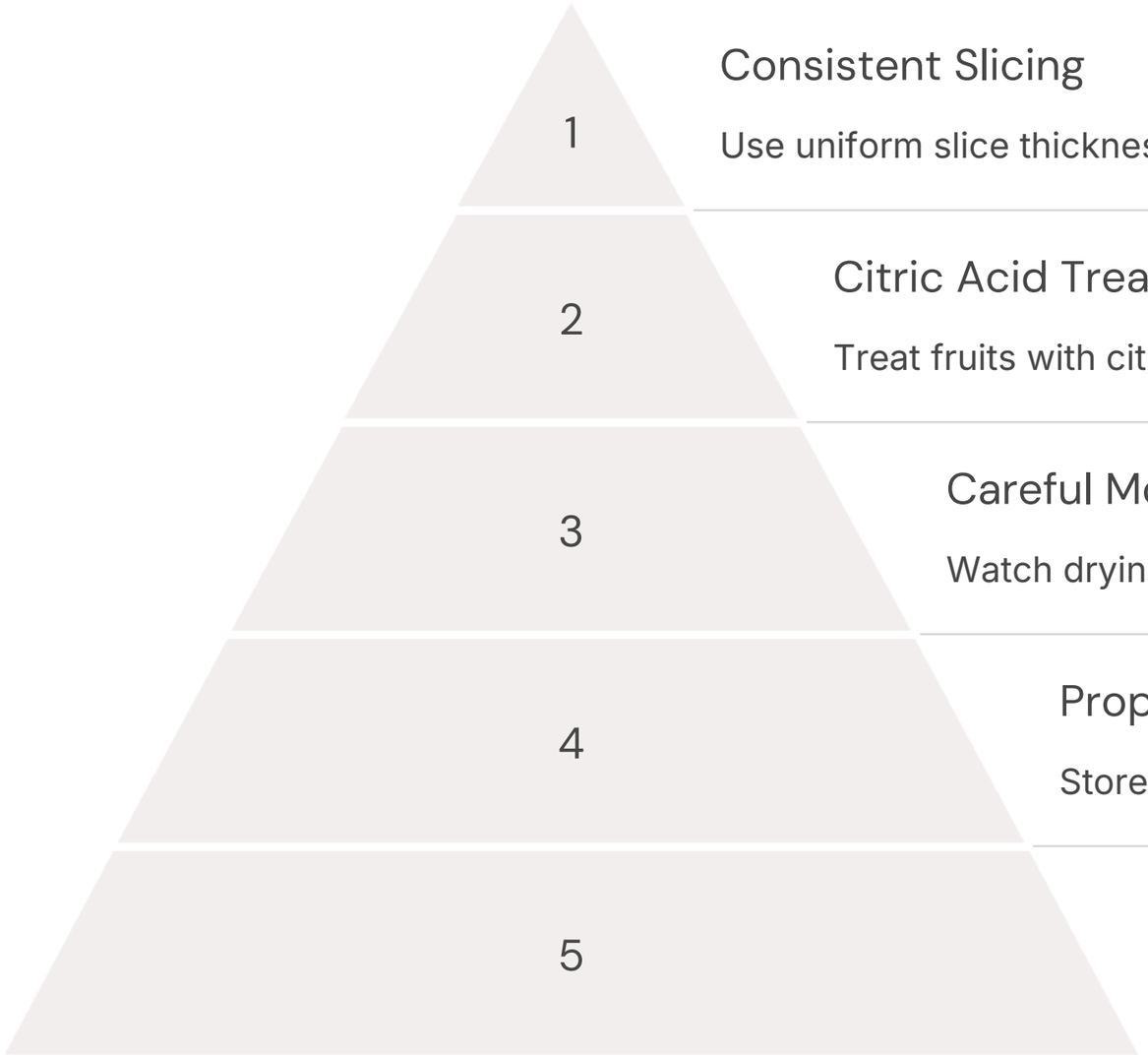
Keep storage areas cool (below 20°C) and dark to avoid heat or light degradation.

Impact of Drying on Color Changes

Treatment	Color Retention	Cause of Browning
No Citric Acid	Low	Enzymatic browning (PPO activity), Maillard reactions during drying
With Citric Acid	High	Inhibition of PPO activity through pH reduction and chelation of copper ions



Best Practices for Shelf Life Extension



Consistent Slicing

Use uniform slice thickness for even drying.

Citric Acid Treatment

Treat fruits with citric acid solution before drying.

Careful Monitoring

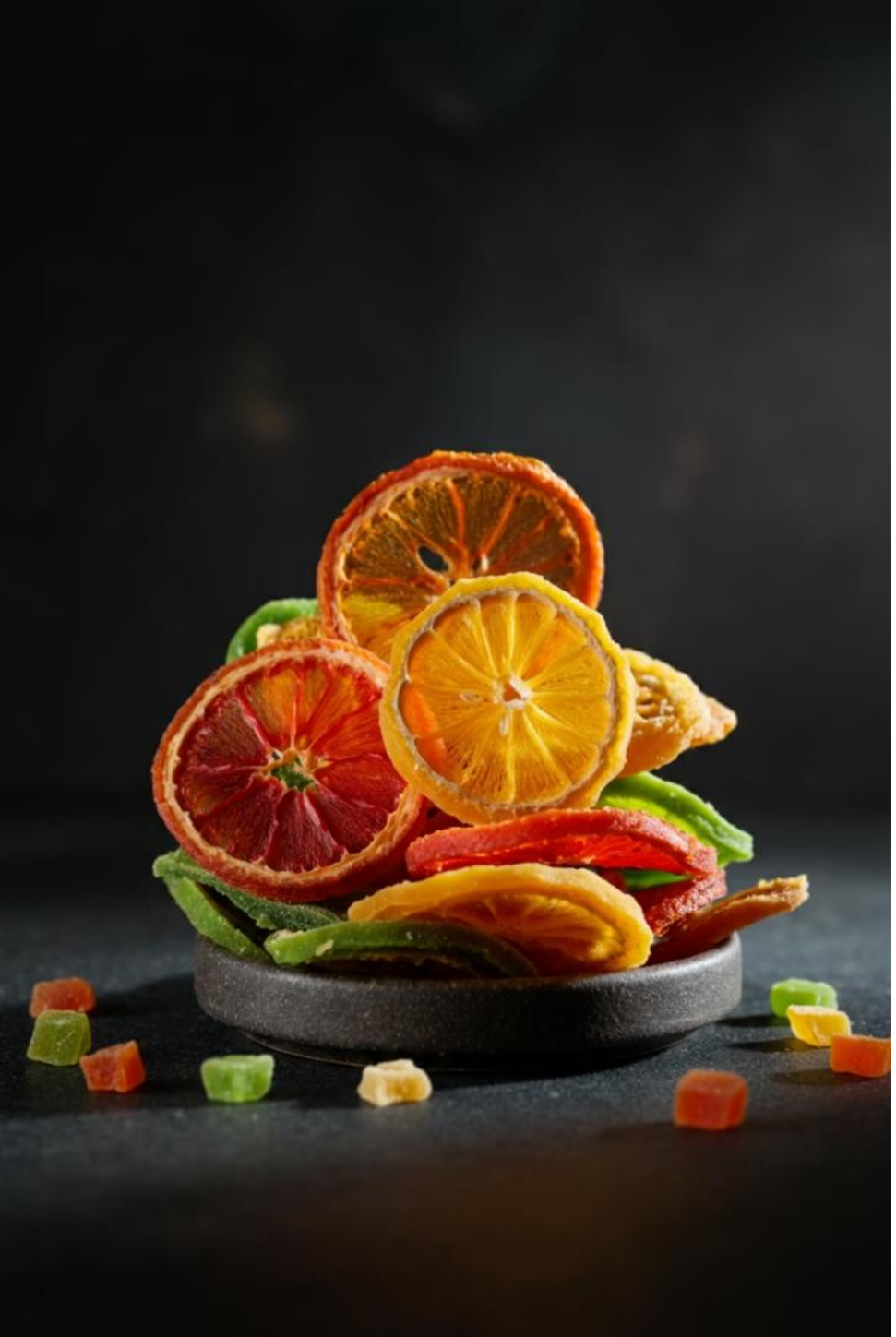
Watch drying times to avoid under or over-drying.

Proper Storage

Store in airtight containers immediately after cooling.

Labeling

Mark containers with production dates for tracking.



Benefits of Citric Acid Treatment

Enhanced Color

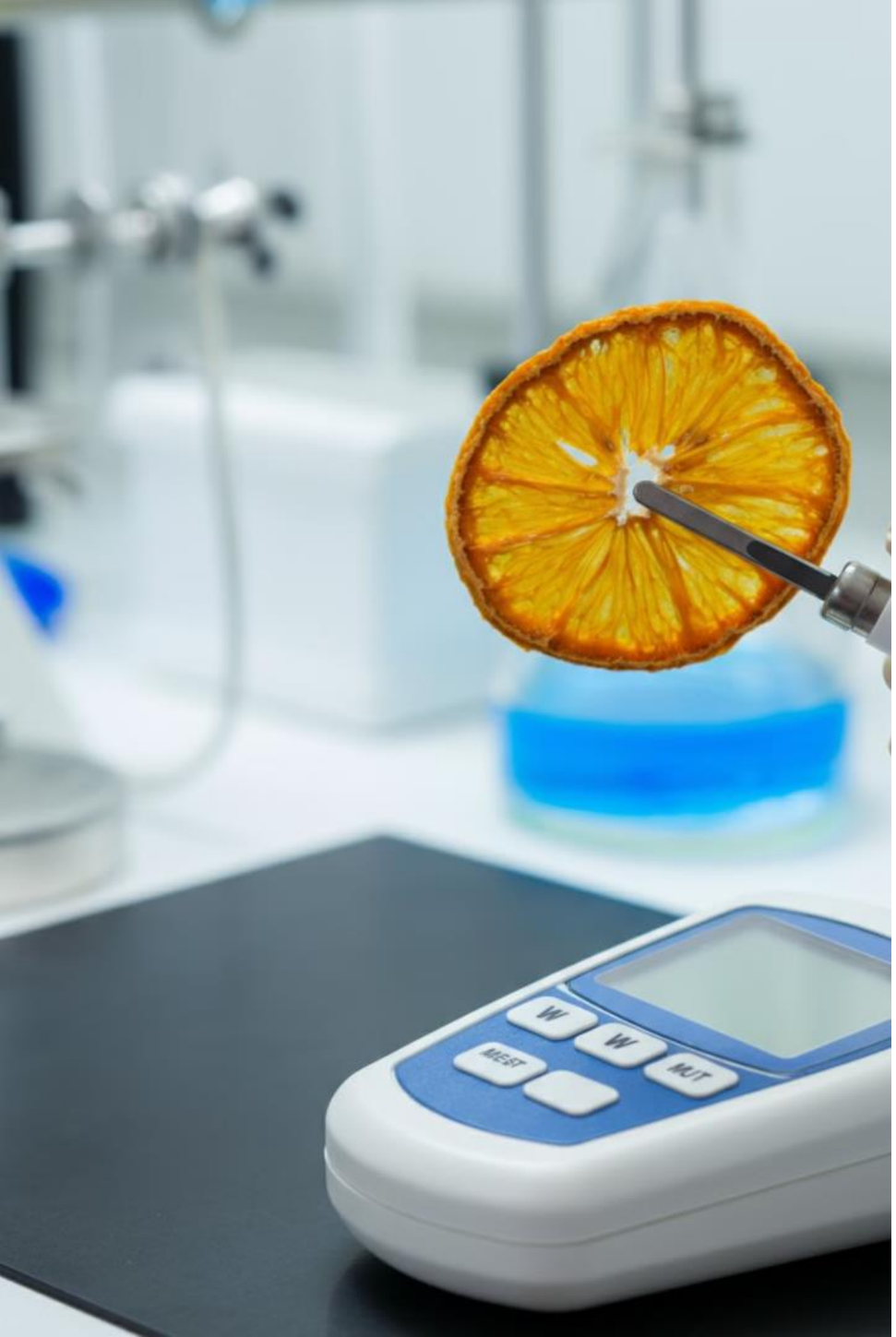
Preserves natural fruit colors, improving visual appeal.

Extended Shelf Life

Inhibits enzymatic browning, prolonging product quality.

Preserved Flavor

Maintains fruit's natural taste by preventing oxidation.



Water Activity (aW) Importance

0.908

Fresh Apple aW

Typical water activity of a fresh apple.

0.60

Minimum Dried aW

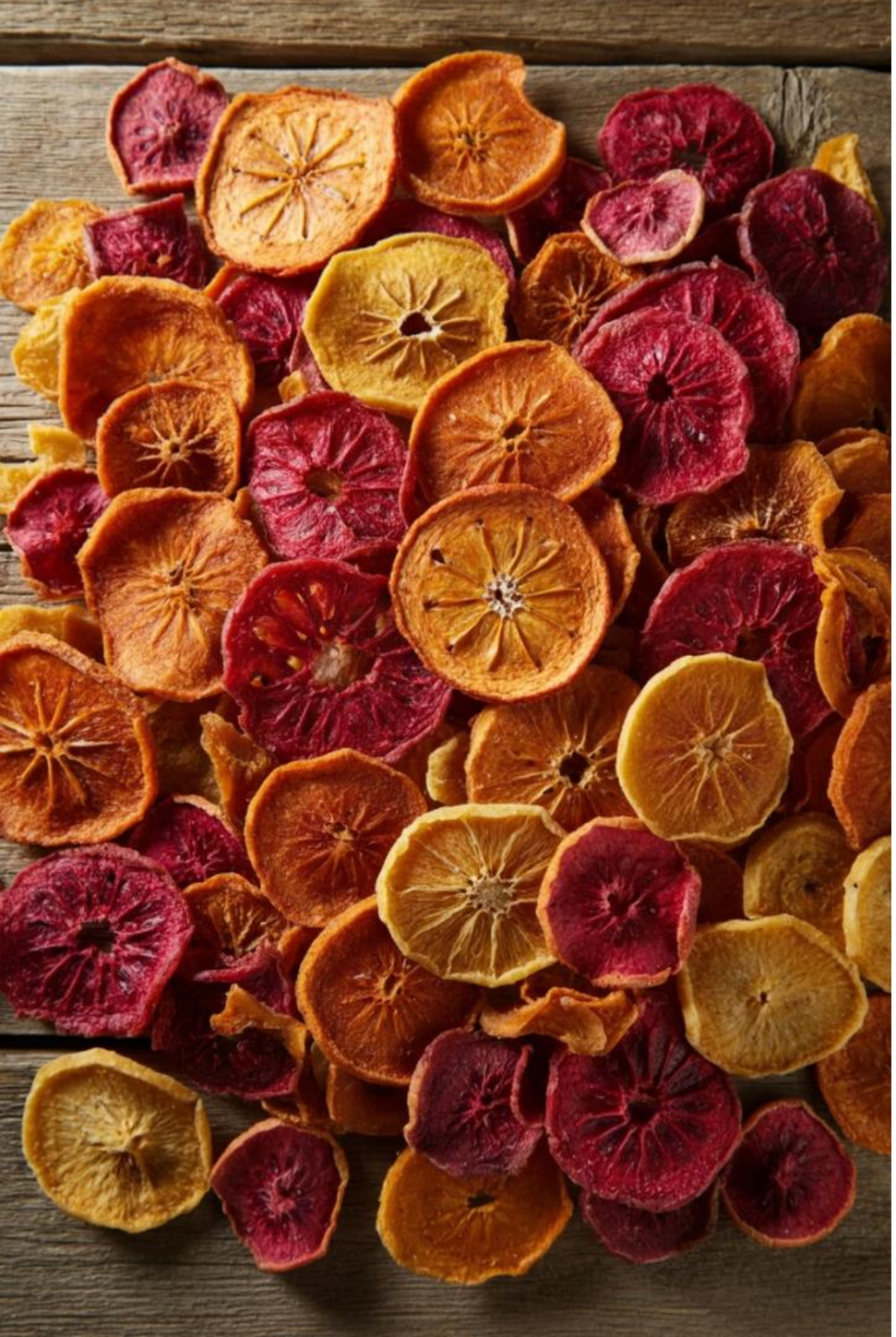
Lower limit for dried fruit water activity.

0.70

Maximum Dried aW

Upper limit for dried fruit water activity.

Maintaining proper water activity is crucial for preventing microbial growth while preserving texture.



Conclusion

Effective Preservation

Drying extends shelf life while preserving flavor and nutritional value.

Color Enhancement

Citric acid treatment significantly improves color retention.

Quality Assurance

Proper drying and storage ensure product stability for up to a year or more.