# Smart Mango Drying Methods

This document summarizes smart mango drying methods with their smart features, advantages, drawbacks, and a brief implementation guide.

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| Method | Smart Features | Advantages | Drawbacks | Guide (How to Implement) |
| Heat Pump Drying | Automated temperature & humidity control | High quality, energy-efficient, scalable | High initial investment | Install a heat pump dryer chamber; set drying temp (~50 °C) & humidity via control panel; load trays and let system run automatically. |
| Vacuum Microwave Drying | Microwave + vacuum chamber | Fast, preserves nutrients & color | Very costly, small batch | Use a vacuum microwave unit; slice mangoes thin; load inside chamber; run short microwave cycles under vacuum (low oxygen). |
| IMCD (Microwave–Convective Drying) | Alternating microwave bursts + hot air | Energy-saving, better texture | Needs advanced control | Set dryer to alternate 2–5 min microwave bursts with 5–10 min hot-air cycles; monitor mango moisture loss until ~15%. |
| Refractance Window Drying | Thin film over heated transparent surface | Very fast, good nutrient retention | Works only for purees | Blend mango into puree; spread thin layer on drying film; circulate hot water beneath “window” until dry sheets form. |
| Supercritical Fluid Drying | Uses CO₂ at supercritical state | Excellent preservation | Extremely expensive | Place mango slices or puree in supercritical CO₂ chamber; adjust pressure (7–8 MPa) & temperature (~35 °C); moisture is extracted. |
| Infrared Freeze Drying | Infrared speeds sublimation during freeze-dry | Retains texture & vitamins | High cost, energy-intensive | Pre-freeze mango slices; place in freeze-dryer with infrared lamps; run sublimation at low pressure until fully dry. |
| Ultrasound + Heat Pump | Ultrasound enhances low-temp drying | Retains vitamin C & polyphenols | Still experimental | Place mango slices in ultrasonic-assisted heat pump dryer; set ~45 °C; ultrasound waves help release moisture faster. |
| Intermittent Hot-Air Drying | Cyclic hot-air control (on/off) | Improves color & antioxidants | Slower | Modify hot-air dryer with timer; run air at 60 °C for 10 min ON, then 5 min OFF; repeat until mango moisture is 15–18%. |
| Solar IoT–Integrated Drying | IoT sensors + solar chamber + remote monitoring | Renewable, low cost, real-time control | Needs IoT setup & sunny climate | Build/obtain indirect solar dryer; install temp & humidity sensors linked to Arduino/Raspberry Pi + cloud dashboard; monitor & adjust airflow remotely. |