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Sun Drying for Preservation of Some Crops in Sudan

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Drying

- ✓ food preservation
- ✓ removing water from food
- ✓ prevents microorganisms growth and decay
- ✓ slows down the action of enzymes

Sun drying

- ✓ one of the oldest methods of preserving foods
 - ✓ can be an alternative to canning or freezing
 - ✓ natural, simple, safe and cheap
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- Sunlight is the total spectrum of the electromagnetic radiation given off by the sun
 - Sunshine is a combination of bright light and heat
 - The World Meteorological Organization defines sunshine as direct irradiance from the sun measured on the ground of at least 120 watts per square meter

Benefits

- ✓ lengthening storability
- ✓ maintaining quality
- ✓ facilitating handling (packing, transport, storage, marketing...etc.)
- ✓ availing food in off season and in remote areas

Nevertheless

- ✓ the process takes more time and extra space
- ✓ the product may expose to air dust
- ✓ the dried food attractive to birds and insects

In Sudan many crops

- dried under the sun rays due to right combination of:
 - ✓ high temperatures
 - ✓ low humidity
 - ✓ and air current

Sun shining

- half day during the whole year
- suitable temperatures dry crops safely without making
 - ✓ sugar carmellisation
 - ✓ protein denaturation

Hence

- ✓ maintain product quality

Plant parts used for sun drying

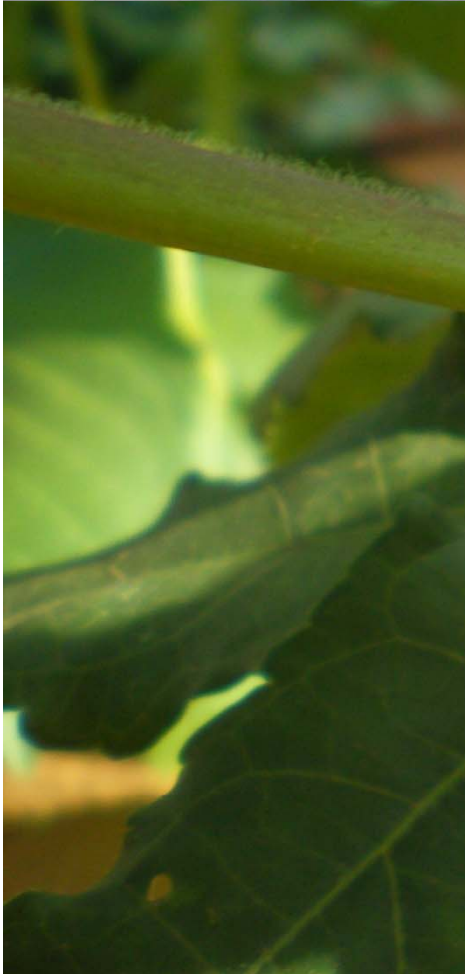
- ✓ whole fruit (lime, hot pepper, and okra)
- ✓ sliced fruit (tomato, mango, and onion)
- ✓ leaf (Jew's mallow, fennel)
- ✓ seed (beans, peas)
- ✓ flower (hibiscus)
- ✓ nodules (gum arabic)

Sun dried commodities used as

- ✓ foods directly or after milling
- ✓ crop export

OBJECTIVE

Sun drying methods traditionally used to preserve some crops (fruits, vegetables, etc...) in Sudan and their effect on quality attributes.



Jew's mallow
Corchorus spp



fresh



Sun



shade

Pepper
Capsicum annuum



fresh



sun dried



Two drying methods (cabinet and sun) on mango (*Mangifera indica*) and tomato (*Lycopersicon esculentum*) slices



- ✓ no difference between quality aspects and sensory properties in mango slices
- ✓ quality of cabinet dried tomato slices was better

Mangodeen (dried mango pulp) in a sheet



Physiochemical properties of mango and mangodeen of some Sudanese cultivars

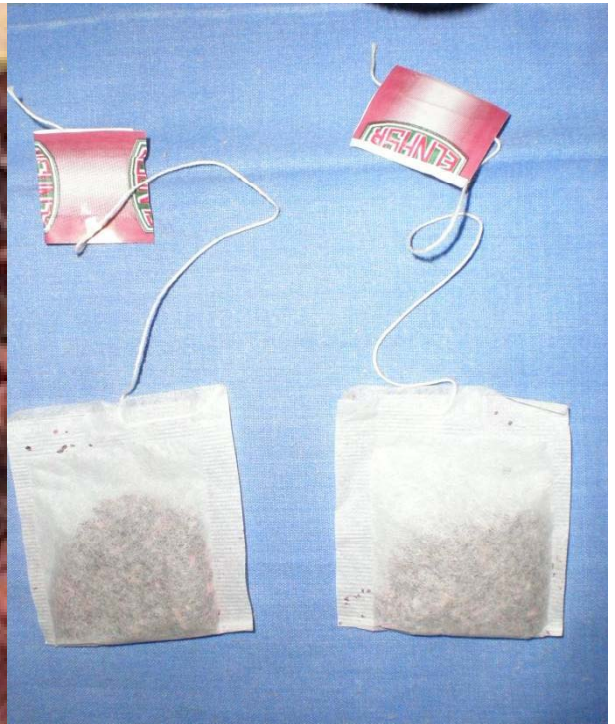
Parameter	Mango	Mangodeen
Weight (g)	107-430	
Skin (%)	19-32	
Pulp (%)	38-65	
Stone (%)	14-24	
Moisture content (%)	56-93	21-18
Ascorbic acid (mg kg ⁻¹)	120-910	950-1000
Total soluble solids (Brix)	17-25	82-79
Total solids (%)	10-15	84-86
Reducing sugars (%)	2-3	39-49
pH	3-4	3.8
Acidity	0.3-1.6	0.2-1.6
Hydration coefficient		4.5-5.1
Ash (%)	1-2.4	
Fibre (%)	0.4-1.6	

Source: Mohamed (1994), Alfatih (2002), Abdelmoneim (2006)



Hibiscus sabdariffa

- ✓ **Drying only at farm**
- ✓ **Around 3 days**
- ✓ **On Traditional covers**
- ✓ **Better drying on shade (color preservation)**
- ✓ **After marketing → cleaning and gradin**
- ✓ **Export or local processing (tea bags)**





Gum sun drying

- ✓ December-April
- ✓ Starts after delivery in factory
- ✓ Stops in rainy season
- ✓ Gum → cleaned sterilized concrete playground
- ✓ Samples → MC in lab (105 °C/3 h)
- ✓ Period (one week or more) depending on initial MC
- ✓ Initial MC (18 - 23%)
- ✓ Suitable MC is 15%
- ✓ Hygrometer → MC primary Check
- ✓ Suitable MC → processing unit



Gum arabic processing (powder, kibbled & spray-dried) depends on the success of drying method



Strength and weaknesses of sun drying process

Strengths and opportunities	Weaknesses and Threats
Availability	Need extra time
Sustainability	Need extra place
Economically feasible	Exposure to air dust materials
Environmentally sound	Health hazards, birds, insects....etc.
Lengthening storability	Some quality troubles, vitamins or pigments loss
Preserving quality	Temperature fluctuations
Facilitating handling Packing, transport, marketing	Birds and insects are attracted to dried fruits
Continuous supply in off season and remote areas	
Natural process (organic product)	
Simple, easy	

Conclusions

- ✓ Sun drying is suitable for food preservation
- ✓ Sun drying maintain product quality
- ✓ High temp. may affect flavor, texture and color
- ✓ Low temp. lead to microorganisms development before drying
- ✓ High temp. & low humidity may harden the crop surface
- ✓ Despite the presence of advanced processing techniques, still sun drying is the major step in processing
- ✓ Research is needed to minimize the shortcomings and constraints



FRPC in Sudan recommendations

✓ Preparation methods (type, cutting, selection) should be controlled

✓ Local covers (*haseer* or *brish*) should be replaced by trays made of local materials (wood, polyethylene) and elevated 90 cm from the ground



✓ Blanching and sulphuring of the product for color preservation (prevent enzymatic and non enzymatic change)



✓ Preservative solution (sodium chloride, sugar and salt & meta bisulphate) in food and vegetables improve color and texture





Dried meat slices



Meat slices powder



Dried pepper powder



Dried okra powder

Thank you for your attention



Fermented bread

bread

rice

Jew's mellow

okra



