



PRESERVING FOOD BY: PRESSURE CANNING, BOILING WATER BATH, DEHYDRATING AND FREEZING

Presented by:
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Potter County Master Gardener



PRESSURE CANNING & CANNING LOW-ACID FOODS AT HOME



Cooperative Extension
The University of Georgia



Low Acid Foods

pH greater than 4.6

- Generally all vegetables
- Meats
- Poultry
- Seafood
- Soups
- Mixed canned foods

(low acid + acid)

However, if $\text{pH} < 4.6$ = acidified foods



Canning Low Acid Foods

- ▣ Temperatures of 240 F or above needed for reasonable process times.
 - 10 psig = 240 F at sea level.
 - 15 psig = 250 F at sea level.



Two Methods of Canning

- ▣ **Boiling Water Canning**
 - Used for higher acid foods
- ▣ **Pressure Canning**
 - Used for low acid foods
(and some acid foods
or any foods you choose)




Why Two Methods of Canning?

Clostridium botulinum!

- ▣ Yeasts, molds and most bacteria are destroyed at boiling temperatures (212°F at sea level).
- ▣ *C. botulinum* forms spores that require higher temperatures for destruction in a reasonable period of time (usually 240°F or above at sea level).



Botulism Food Poisoning

- ▣ The botulinum toxin, one of deadliest known, causes botulism food poisoning.
- ▣ 1 mg can kill 655 tons of mice. 
- ▣ Food can contain toxin without showing signs.
- ▣ Antitoxin is available, but there is slow recovery. Permanent nerve damage possible.



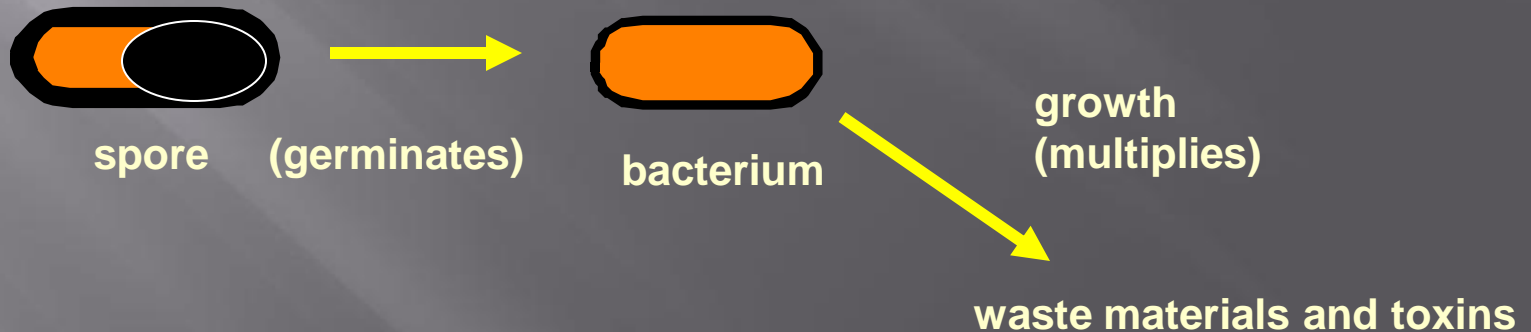
Botulism Food Poisoning

- ▣ Symptoms usually appear within 12 to 72 hours:
 - Digestive upset (in some cases)
 - Blurred, double vision
 - Difficulty swallowing, speaking and breathing
 - Possible death from suffocation



Botulism Food Poisoning

- ▣ To germinate and produce toxin, the spores need the following conditions:
 - Anaerobic
 - Low acid ($\text{pH} > 4.6$)
 - 40°F to 120°F
 - Relatively high moisture



Preventing Botulism

▣ Home Canned Foods

- Spores won't germinate in acid foods ($\text{pH} < 4.6$).
- Spores are killed when heated long enough at a specific temperature.
- USDA usually recommends 240°F at sea level for canned low-acid foods.
- Pressure canner must be used for all low-acid foods.





Preventing Botulism, cont.

- ❑ Food must be properly prepared and processed correct time.
- ❑ Canner must be accurate and operated correctly.
- ❑ Foods must be checked carefully when opening jars.



Preventing Botulism, cont.

- ▣ Follow recipe exactly.

The following slow down heat penetration:

- Extra sugar or fat
- Oversize food pieces
- Added thickeners

- ▣ Use recommended canners.

Heat-up and cool-down times in pressure canners are counted toward sterilizing value of the process. Don't rush them.



Pressure increases temperature

Only safe way to can low-acid

Altitude Adjustments

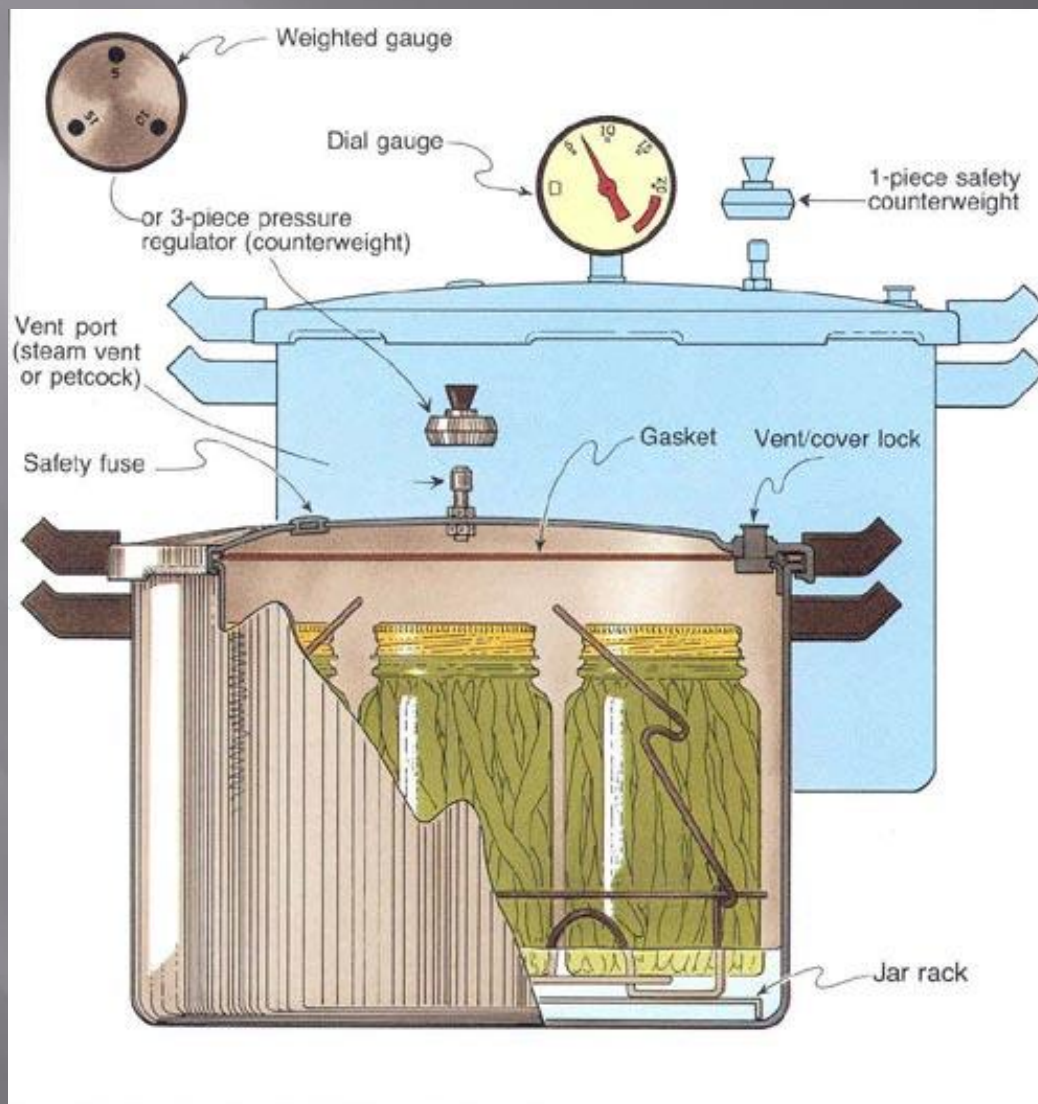
- ▣ As altitude increases, temperatures decrease at a given pressure.
- ▣ As altitude increases, increase pressure.
- ▣ Dial Gauge
 - 1001-2000 ft: 11 psig
 - 2001-4000 ft: 12 psig
 - 4001-6000 ft: 13 psig
 - 6001-8000 ft: 14 psig
- ▣ Weighted Gauge
 - Altitude adjustment requires increase of 5 psig pressure.
 - 1001 ft and above: 15 psig



Pressure Canners

- ▣ Flat rack in bottom.
- ▣ Pressure regulator or indicator.
 - Dial or weighted gauge.
 - Older: petcocks.
- ▣ Vent pipe (port) for pressurizing.
- ▣ Safety valves or overpressure plugs.
- ▣ Safety locks when pressurized.
- ▣ Flexible gasket in lid or
 - One type: metal to metal seal.
 - Gasket sometimes called “sealing ring” in manufacturer’s book.





Pressure Canners, cont.

▣ Dial Gauge

- Indicates pressure inside the canner.
- Must be checked for accuracy.
- More flexibility in altitude adjustments – small psig increments.
- Has dead- or counter-weight to close/open vent for pressurizing.
 - ▣ Not to be used for indicating pressure.
- Pressure is increased or decreased by adjusting burner heat.



Pressure Canners, cont.

▣ Weighted Gauge

- Regulates pressure inside the canner.
- Open vent is the same one that pressure regulator fits.
- Will continue to allow some air to be released from canner during process.
- Can't be tested for accuracy.
- Altitude adjustment requires increase of 5 psig pressure.



Pressure Canners vs. Cookers

- ▣ To be considered a pressure canner for USDA processes, the canner must be big enough to hold at least 4 quart-size jars.
 - Pressure cookers/saucepans with smaller volume capacities are not recommended for use in canning.
 - Enough heat may not be delivered during pressurizing and the cool-down period in smaller pressure cookers/saucepans.





Pressure Canners, cont.

Using PC the First Time

- ▣ Some parts may need assembling; see manufacturer's directions.
- ▣ Become familiar with parts and their functions.
- ▣ Clean to remove manufacturing oils. (cover, body and gasket)
- ▣ Parts are usually pre-lubricated. May need to very lightly coat the exposed gasket and lugs on the canner body with cooking oil. Avoid if possible.
- ▣ Before EACH use: be sure vent pipes are clear and open.

Venting the Canner

- ▣ Also called “exhausting” the canner.
- ▣ As the water boils in the canner, the “empty” space becomes a mixture of steam and air.
- ▣ The temperature of a steam/air mixture is lower than the temperature of pure steam.
- ▣ Venting eliminates (“exhausts”) the air so processing takes place in a pure steam environment.
 - Process times are intended only for a pure steam environment.



Venting the Canner, cont.

- ▣ Some manufacturers of weighted gauge canners say venting is not necessary.
- ▣ USDA instructs to vent ALL pressure canners.
 - The one difference in “following manufacturer’s directions” if not included there.
- ▣ Without proper venting, up to 30% of the sterilizing value of a 20-minute process may be lost.
 - At 10 psig.



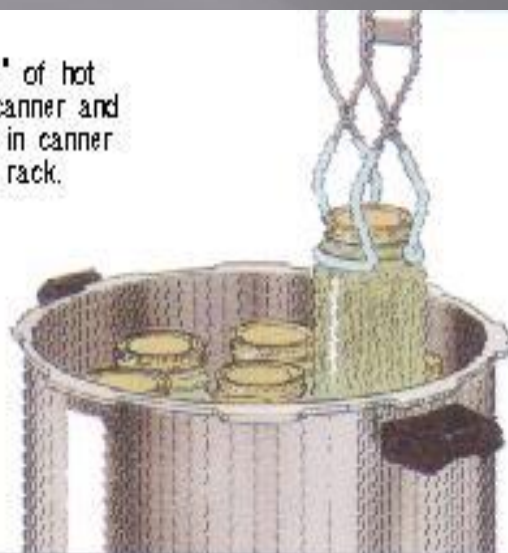
Venting the Canner, cont.

- ▣ Steam must flow freely from the open ventport in the lid for 10 minutes prior to pressurizing.
 - After putting filled jars in the pressure canner, fasten the lid in place.
 - Leave the ventport open.
 - ▣ Pipe where weighted gauge or dead weight will go.
 - Turn the heat on high.
 - When water boils, steam will start to come out of open vent.
 - Wait until there is a constant, strong funnel of steam, then start timing 10 minutes.
 - At the end of the 10 minutes, place weight in place to start pressurizing the canner.





Place 2"-3" of hot water in canner and place jars in canner on canner rack.



1.

Temperature

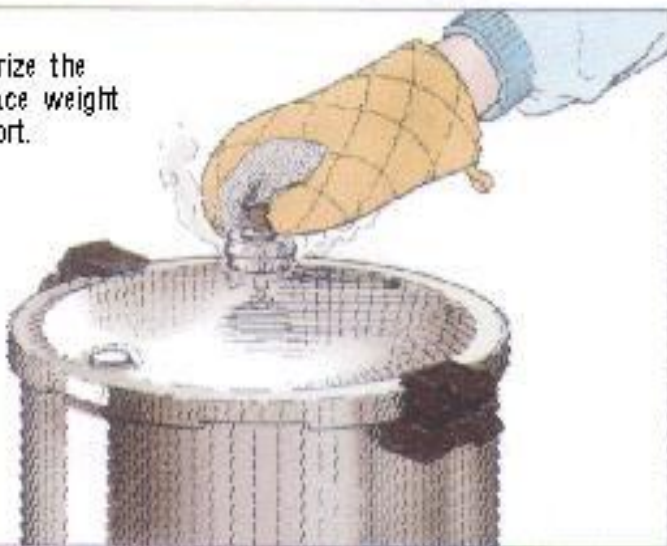


Exhaust all air from the cooker with vent port open



2.

To pressurize the canner, place weight on vent port.



3.

Begin timing when weight starts to rock or jiggle, or when pressure gauge reads the correct pressure.

Time



4.

Pressure Canner Processing

- ▣ Use 1 inch headspace in jars.
 - A few products use 1-1/4"
- ▣ Have 2" to 3" of water simmering or hot in canner.
 - Hot packed jars – simmering water, 180 F
 - Raw packed jars – warm to hot water, 140 F
- ▣ Place jars on rack in canner.
- ▣ Put lid on canner with weight off or petcock open.



Pressure Canning, cont.

- ▣ Exhaust canner 10 minutes.
 - All pressure canners, according to USDA.
- ▣ Close vent or petcock.
- ▣ Start counting process time when correct pressure is reached.
- ▣ Adjust pressure for altitude, if needed.
- ▣ Turn off heat at end of processing.
- ▣ Let pressure drop to 0 psig naturally.





Pressure Canning, cont

- ❑ Wait about 1-2 minutes after pressure drops to 0 psig to make sure all pressure is gone.
(For some canners, check that locks in handles are released.)
- ❑ Remove weight or open petcock. Wait 10 min.
- ❑ Open canner. (Be careful of steam!)
- ❑ Remove jars to padded surface or rack.
- ❑ Cool jars 12 to 24 hours, undisturbed.
- ❑ Check that jars have sealed.

Loss of Pressure

- ▣ Drop in pressure during processing means the sterilizing value of the process will be decreased.
 - Underprocessing
- ▣ Foodborne illness (botulism) and/or spoilage could result.
- ▣ If pressure drops below target anytime during the process time, bring the canner back up to pressure and start timing the process over, from the beginning.



Fluctuating Pressure

- ❑ Large and/or quick variations in pressure during processing may cause loss of liquid from jars.
- ❑ If the variation is a drop in pressure after process has begun, it also means the process must be started over.



AVOID Force Cooling

- ▣ Done by cooling the canner with running cold water or opening the vent port before canner air cools to 0 psig.
 - Do not cover with wet towels; do not put in cold air drafts.
- ▣ May result in:
 - Food spoilage.
 - Foodborne illness.
 - ▣ Underprocessing
 - Loss of liquid from jars.
 - Seal failures.
 - Warping of canner lid.



Storing Canner

- ❑ Thoroughly dry canner, lid and gasket. Do not put lid in water.
 - Older canners: Take off removable petcocks or safety valves. Wash and dry. Reassemble carefully.
- ❑ Clean openings by running clean pipe cleaner or thin strip of cloth through them.
- ❑ Store canner with crumpled clean paper or paper towels in it; do not fasten the cover.
- ❑ Wrap cover in paper and turn upside down on the canner bottom.



Replacement Parts

- ▣ Dial gauges when inaccurate.
- ▣ Gaskets (sealing rings).
 - Every 2 years usually
- ▣ Rubber overpressure plugs.
 - Every 2 years
- ▣ Vent pipes if clogged.
- ▣ Air vent/cover lock from lid.
- ▣ Weighted gauges or dead weight if lost.



Testing Dial Gauges

- ▣ Accuracy of gauge essential to safety of the canned food.
- ▣ Two ways:
 - Maximum thermometer
 - Comparing to master dial gauge
- ▣ 1 pound error in a 20-minute process causes over 10% decrease in sterilizing value.
 - 2 pound error a 30% decrease.





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Photography Credits

- ▣ Photography credits
 - Elizabeth Andress and Elaine D'Sa, National Center for Home Food Preservation, University of Georgia.
 - Information Staff, Agricultural Research Service, USDA.



The following information is provided
through the experience of
Janean Thompson,
Amarillo Area Master Gardener.

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BOILING WATER BATH CANNING

- ▣ TOOLS

- ▣ PRODUCE

- ▣ PROCEDURE



TOOLS

- ▣ CANNER (WITH RACK)
- ▣ CANNING JARS, LIDS AND BANDS
- ▣ CANNING COLLAR , LADEL and AIR ELIMINATOR TOOL
- ▣ JAR LIFTER
- ▣ SPICES AND ADD-INS
- ▣ PRODUCE





PRODUCT

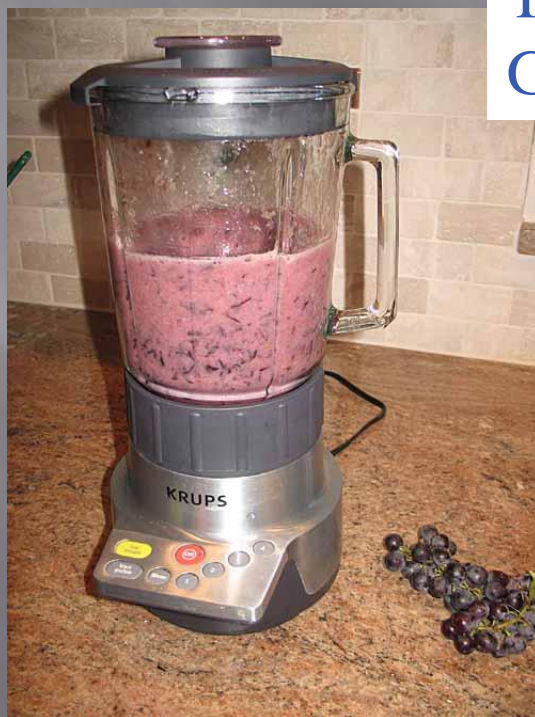
- ▣ CHOOSE VEGETABLES/FRUITS
- ▣ WASH WELL
- ▣ FOR TOMATOES, SLIP SKINS, CORE AND CUT AS DESIRED
- ▣ MOST OTHER VEGETABLES CAN BE PACKED DIRECTLY INTO STERILE JARS but must be processed in a pressure canner for insured safety.



Grapes are easy to grow and provide both fresh fruit and produce for canning. What could be better than a spoon of homemade grape jelly?



The components of grape jelly!
Getting ready to cook!



What you need to make jelly:







PROCEDURE

CANNING TOMATOES (High acid)

- ▣ Begin heating water in canner: water must be deep enough to cover jars by 2 inches.
- ▣ With tomatoes cut and ready, pack jars to within 1 inch of the top
- ▣ Clean the lip of the jar
- ▣ Top with a washed, rinsed, warmed lid
- ▣ Add band and tighten gently – do not power down on the band.



Peel fruit.

**Cut into pieces
and pack into
jars. No
additional fluid
is needed.**





Put on
rings and
lids.

Put jars into
canner and
bring to a boil.





- ▣ With canner water very hot (not boiling, but STEAMING) and a rack in place, carefully set the jars of food into the canner. Cover.
- ▣ Allow canner to come to boil (covered)
- ▣ Start timing when full boil is achieved – leave cover in place during processing.

ONLY APPLICABLE TO ACIDIOUS
FOODS.

GLIDE TIME

TO PROCESS CORRECTLY, THE ENTIRE TIME SUGGESTED ON ANY GIVEN RECIPE MUST BE ACCOMPLISHED. FAILURE TO DO SO IS UNSAFE.



COOLING AND STORAGE

- ▣ ALLOW ITEMS TO COOL SOME IN THE CANNER PRIOR TO REMOVAL. This allows boiling product to settle.
- ▣ REMOVE THE CONTAINERS FROM THE WATER BATH. SET ON A DRY, DISH TOWEL. **DO NOT SET ON A WET COUNTER.**
- ▣ ALLOW TO COOL COMPLETELY WITHOUT DISTURBING.



STORAGE

- ▣ WHEN COOL, CLEAN OUTSIDE OF JARS WITH A DAMP CLOTH
- ▣ STORE IN A DARK, COOL PLACE SUCH AS A PANTRY, BASEMENT OR STORM SHELTER. Light causes deterioration of food appearance and taste quality.



DEHYDRATING FOODS

▣ TOOLS

▣ PRODUCE

▣ PROCEDURE





Nesco American Harvest FD-1018 Gardenmaster dehydrator. Patented Converga-Flow. 1000 watts. The fastest fan-forced drying. Adjustable thermostat. Dries in hours, not days. Solid-state electronic control. Includes 8 trays, 8 fruit roll sheets, 8 drying screens Is expandable to 30 trays.



Excalibur 9-Tray Large Dehydrator

Ideal size for large families, large gardens, craftspeople, and sportsmen. 9 LARGE trays: 15 square feet of tray area makes this the biggest and best there is!



Excalibur 9-Tray Large Dehydrator

Ideal size for large families, large gardens, craftspeople, and sportsmen. 9 LARGE trays: 15 square feet of tray area makes this the biggest and best there is!

Built-in on/off switch 7" fan, 600 watts, Adjustable thermostat and 26-hour timer. The 26 hour timer will automatically shut off the Dehydrator for you when it reaches the time you set.

Unit Dimensions: 12 1/2"H x 17"W x 19"D
Shipping Weight: 22 lbs.



Smaller units are available
for under \$50

- Watch for power limits, fan efficiency and length of time to dry foods.
- Works well but might take longer.
- Unit is usually smaller and easier to store

PRESERVING THE HARVEST: DRYING

Finding a practical preservation method can enable you to enjoy the fruits of your labor long after garden season has ended. Current food preserving practices include drying, canning and freezing .



Dried Onions

PRESERVING THE HARVEST: DRYING

Finding a practical preservation method can enable you to enjoy the fruits of your labor long after garden season has ended. Current food preserving practices include drying, canning and freezing .

Drying food can involve the use of your oven, or a more economical food drying apparatus. Air circulates up and through food trays containing sliced, chopped or pureed food stuffs. Several hours are needed to eliminate the moisture from the food and the dried items can be stored in air-tight containers for long storage.



Dried Onions



Dried Tomatoes

DEHYDRATION: FOOD PREPARATION

- Wash food carefully
- Slice food to an appropriate thickness
- Lay food onto trays without overlaps
- Stack or insert trays and start dehydrator
- Continue drying without interruption until food reaches desired state
- Allow food to cool, then pack and store
- Ziplock bags are great for storage but avoid strong light because it causes loss of color/flavor/vitamins.



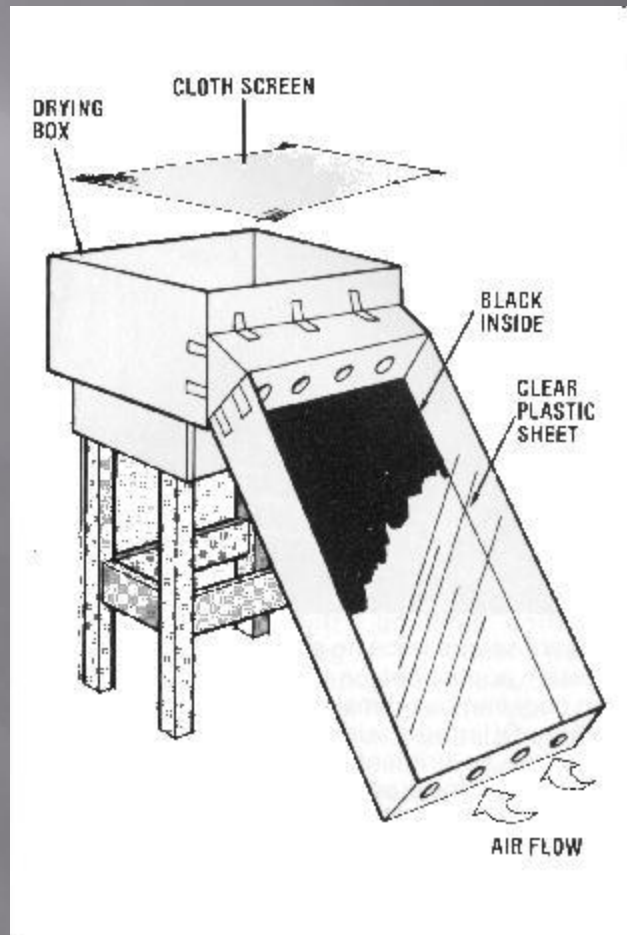
Energy Saving: Build it yourselfSolar Dehydration

You can make your own solar dehydrator:

1. motherearthnews.com
2. rootsimple.com



3. i4at.org (built with cardboard boxes)





4. diylife.com

5. ehow.com (all you need is: Cardboard box, Aluminum foil, Duct tape, box knife, Window screen, Clear plastic wrap)

And dozens more online!

TIPS:

1. Remember to protect produce from insects.
2. Heat in oven after solar dehydration is finished to kill any possible or suspected insect infestation.
3. For long storage of solar dehydrated foods, freeze.

HARVEST TIPS

Harvest all vegetables as they mature, at their best stage for eating. Many vegetables, such as beans, okra and squash, quit producing if not harvested on a regular basis.





Harvesting at the right stage is also a must if you plan to do any canning or freezing. The final quality of your preserved vegetables is no better than the quality you begin with. Vegetables that you can or freeze should be identical in quality to those that are consumed fresh.





To maintain quality after harvest, handle vegetables very carefully. Avoid bruising or damaging them as this encourages decay and a short storage life. Some vegetables, such as sweet corn, peas, asparagus and leafy vegetables, should be cooled to between 35°F to 40°F as soon as possible.

Keep the time between harvesting and eating or preserving vegetables as short as possible. Many vegetables lose flavor and vitamin content if stored too long.





Canning is a very old method of food preservation that is both involved and time consuming, but will yield copious amounts of food that will last for several years. The canning process involves heat and time or heat, time and pressure. Large vats of boiling water surrounding sealed jars can preserve many types of fruits and vegetables. Those best suited for this type of canning are any with moderate to high acid content.



Vegetables and fruits that lack acid, such as green beans, must be processed in a pressure canner. The heat and pressure insure safe, long lasting canned goods.



Methods of freezing foods often include the use of syrups or other liquids to force out air pockets around food. These air bubbles allow discoloration loss of flavor. Explore the possibilities and find a method that suits your lifestyle.





Texas Panhandle sunset