

Packaging For Food Products

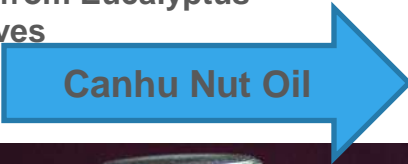
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Oil from Eucalyptus leaves



Packaging materials selection

- What must the package achieve?
- What type of package are available that can do this?
- What are the pros and cons of each of the potential packages in the context of the achievement required?
- What costs will result for each possibility in relation to the other elements of the distribution system?

Selection of proper packaging

Canned foods

How to choose the right can?

- Type of Foods e.g. fruit, vegetable, meat
- Composition of foods
 - Low acid, high acid food, high sulphur
- Product characteristics
 - Solid, liquid, low viscous, high viscous
- Lower Cost

Type of Foods

Sulfide staining	Aggressive products	Less aggressive products
Seeds of legumes e.g. pea, lima beans, Brussels sprouts, cauliflower, tuna meat, sardines	- Fruits & vegetables with anthocyanin pigments (red cherries, red cabbage) - pH \leq 4.5	-Salads, fruits with no anthocyanin pigments, juices and jams derived from them, tomatoes, green beans, celery, endive, spinach, red beet in brine -pH = 4.5-5.8

Lacquer or Enamel

- ☑ Prevent changes in taste or chemical reactions
- ☑ Prevent discoloration of the product
- ☑ Prevent chemical reaction between the metal and the product which might cause corrosion, pitting or formation of hydrogen gas inside the can
- ☑ Prevent discoloration of the product inside can esp. sulphur staining

Type of Lacquer

Epoxy-phenolic lacquer

- ☑ Most used, resistant to acids, have good flexibility and adhesion
- ☑ Fruits, fruit juices, vegetables, soups, meats and fish

Acrylic lacquer

- ☑ Used when good color retention and high resistance to heat needed
- ☑ Used to coat outside but now used inside as hard white coating

Vinyl lacquer

- ☑ Good adhesion and flexibility, but does not resist high temp
- ☑ Free from odor&flavor, use as 2nd layer for beer, wine, carbonated beverage and cake, sweet dry food and pharmaceutical products

Phenolic lacquer

- ☑ Excellent chemical stability and low permeability esp. against sulfide ions
- ☑ Very useful for meat and fish

Oleoresinous lacquer

- ☑ Used for fruits and vegetables in the US, has been replaced by EP lacquer
- ☑ Do not provide good protection against sulphur staining of tin or aluminum

Handling and storage of cans

Can packaging	Cans are best delivered on pallet with an overcover of board, the layers of cans being separated by layer pads; the outer covering should not be removed until the cans are required.
Can storage	Ensure warehouse building is weatherproof and maintained at a constant temperature (16°C), the humidity of the warehouse atmosphere being kept as low as possible
Can handling	Cans should always be handled with care, avoiding denting, rim damage or scratching. Conveying is best done by plastic-covered wire rope, magnetic conveyors or slat conveyors Plastic-covered wire rope reduces 'cable burn'

Selection of proper packaging

Dry fruits and vegetables

Dry Fruits

- ☑ Moisture content 17-40%
- ☑ Some high in moisture content
 - ☑ e.g. prune mc=35-40% susceptible to attack by a range of yeast and molds
 - ☑ Package has low WVTR, so the fruit does not dry out rapidly
- ☑ Sometimes SO_2 is used to preserve color by inhibiting non-enzymatic browning, also help prevent microbial growth
- ☑ Flexible film pouches, waxed paperboard drums and boxes are often used

Dry Fruits

- ☑ Packages need to prevent or minimize the ingress of moisture
- ☑ Packages sometimes need to prevent the ingress of O₂
 - ☑ Carrot, apricot can undergo oxidative deterioration
 - ☑ Dehydrated potato can develop stale rancidity without O₂ presence
- ☑ Vacuum or N₂ flushing may be used for product sensitive to oxidation

Packaging Selection for Dry Fruits

Flexible packages (Single or multilayer)	Good moisture barrier, inexpensive
Paper or composite cans	Good moisture barrier, re-closable
Metal cans	Expensive, provide longer shelf-life



Selection of proper packaging

Snack foods

Snack foods

- ☑ Chips, nuts, crackers, etc.
- ☑ Moisture sensitive foods, so tend to absorb some moisture from outside and loss the crispiness
 - ☑ Critical moisture content \cong 3-3.5%
- ☑ High fat content, so easy to rancidity
- ☑ easy to break due to its crispiness

Packaging for snack foods

- ☑ should provide moisture barrier
- ☑ should provide O₂ barrier
- ☑ should provide light barrier e.g. met film, Al foil for longer shelf life
- ☑ should have fat/oil resistance
- ☑ Availability with suitable cost

Packaging for snack foods

Shelf life	Packaging film
Short shelf life (~ 2 weeks)	LDPE, CPP
Moderate SL (~ 2 months)	OPP/PE, OPP coated with saran OPP/cellophane coated with saran PET coated with saran/PE
Long SL (≥ 5 months)	Paper/Al/PE, OPP/met CPP, OPP/Al/PE, PP/met PET

Selection of proper packaging

Jams

Jams

- ☑ High sugar content and the low pH preserves the product after the package has been opened
- ☑ Glass jar is the most popular package
- ☑ Lacquered metal closure is used to ensure hermetically seal to avoid mold growth
- ☑ For bulk packs, jam is hot-filled into large PE lined paperboard cartons

Cordials or juice concentrates

Packaging materials need to

- ☑ maintain good hygiene
- ☑ Have sufficient mechanical strength to prevent leakage and contamination from outside
- ☑ Be inert and provide barrier to light
- ☑ Air must be removed to avoid oxidation
 - ☑ ascorbic acid, odor, flavor
- ☑ Seal is important and low gas permeability is required
- ☑ Container must meet the demands of processing and filling lines

Packaging requirement

Glass bottle

- ☑ Inertness
- ☑ Easy cleaning
- ☑ Durability and rigidity
- ☑ Glass is not susceptible to mold growth and is impermeable to odors, vapors and liquids
- ☑ Hot-filled and in-bottle pasteurization can be applied

Packaging requirement

Plastic bottle

- ☑ PET has better impact resistance and tougher than PVC
- ☑ For larger container, PET is more economical
- ☑ PVC bottles are more liable to irregular wall thickness than PET
- ☑ PE and PVC bottles are still used for squashes and cordials, but shelf life is restricted compared to glass
- ☑ PVC is not acceptable in some countries.

Packaging requirement

Metal can

- ☑ Plain and lacquered cans are used
- ☑ The juice tends to deteriorate in the can due to corrosion and an increasing amount of tin and iron in the product
- ☑ Usually hot-filled, sometimes aseptically filled or cold-filled after pasteurization is used

Chutnies

pH of product

- ✓ pH > 4.5, need 60-90 min at 121°C
- ✓ pH < 4.5, requires 20 min in boiling water (mild heat)

Metal can

- ✓ Plain or lacquered cans are used
- ✓ Correct lacquer is needed to avoid corrosion
- ✓ All air must be removed prior to sealing to minimize internal corrosion

Glass jar

- ✓ For premium end market
- ✓ Production rate much lower than can
- ✓ Twist-off or Press-on Twist-Off closure with proper liner are used to ensure hermetically sealed

Chutnies

- Plain or lacquered cans normally used
- Air must be removed to avoid corrosion
- Premium product may be packed in glass jar sealed with twist-off or Press-on Twist-Off closures
- Retort pouches are sometimes used

Pickled fruits and vegetables

- Clear pickles are usually packaged in jars topped with liquor, pasteurized and hermetically sealed.
- The short time lower temperature pasteurization used destroys the acetic tolerant spoilage bacteria. Higher temp and long times will inactivate microbial enzymes and therefore the temperature and time used depend on the product.
- Pickles in sauce are usually made by preparing the sauce separately from the particular components and the method used depends upon the ingredients. After the sauce and the pretreated fruit or vegetables have been mixed, the product is filled into jars and hermetically sealed.

Pickles

Spoilage for pickles can arise from

- ☑ Growth of yeasts, molds or bacterial
- ☑ Deterioration in organoleptic quality from the action of enzymes of either vegetable or microbiological origin or through oxidation
- ☑ Deterioration from trace metals causing oxidative rancidity e.g. iron
- ☑ Deterioration from the physical or chemical interaction of the ingredients, e.g. maillard reactions, browning of onions
- ☑ Presence of foreign matter as a result of packaging or storage failures.

Packaging consideration

- Packaging used for vinegars, pickles and sauces, etc. must protect them from microbiological or foreign matter contamination and oxidation by keeping **oxygen** out.
- **Moisture** uptake should also be avoided.
- Glass jars and cans, often with outer cartons or shrink-wrap - The interior of the closures and the container itself must be resistant to **acetic acid**.
- Chilled storage of 5° C is recommended.

Packaging selections for Pickles

Metal can	Withstand high temperature, standard size available, expensive
Glass container	Withstand high temperature, transparency, product presentation, standard size available, closure needs to withstand high pressure and temperature
PE bag	Inexpensive, availability, limit shelf life
Metal drum	Transport package, coating or thick PE bag is needed
Retort pouch	Withstand high temperature, expensive, reduce handling and transport cost, better nutrition preservation than glass
Bag-in-Box	Reduce transportation cost



Thank you for your attention!