Module 6.2

Guidelines for vegetables processing

Roberto Moscetti*, Serena Ferri, Flavio Raponi, Riccardo Massantini**

Affiliation: Department of Innovation in Biology, Agri-food and Forest systems, University of Tuscia, Viterbo (Italy)

*corresponding author: rmoscetti@unitus.it

** scientific responsible: massanti@unitus.it
Outline

EU Organic farming, rules on production

Definition of fruit and vegetables processing:
- Minimally processed
- Moderately processed
- Highly processed

Description processing methods:
- Fresh-cut vegetables
- Vegetables canning
- Refrigeration and freezing preservations
- Drying vegetables
- Processing of vegetable juice and blends
- Vegetables fermentation and pickling
- Vegetable spices and herbs
Learning Outcomes

- Improved the basic and applied concepts and knowledge of food quality and processing applied to raw materials produced according to organic practices.
- Enhance technical knowledge required to optimize process and technologies to organic raw materials of organic production and the factors that need to be taken into account.
- Develop knowledge and skills on food quality and safety and main criteria applied to organic produce.
Processing of Asparagus – General Aspects

The mature asparagus plant is dark green-fern-like foliage of about 0.91 m height. The edible portions of asparagus are the spears or the stems (cladophylls) that develop from the crown; asparagus can be white, purple, green, or a combination of purple and green.

The plant can be productive for 15 years or more.

Harvesting of the asparagus begins in the spring.

Asparagus stored for about 2-3 weeks at a temperature of 2 degrees and at a high relative humidity (90-95%).
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**PROCESSING OF ASPARAGUS – GENERAL ASPECTS**

After harvesting, the asparagus is directed to the processing lines.

- Minimal processing
- Freezing
- Canning
PROCCESSING OF BROCCOLI – GENERAL ASPECTS

Broccoli (Brassica oleraceae var. italic) belong to the Brassicaceae family (formerly known as Cruciferae). Many crops of colas such as cauliflower, cabbage, chickens, bok choy and brussels sprouts belong to the B. oleracea. Broccoli is a fast-growing and compact plant with flesh head and narrow heads of flowers (curds) or buds, usually green in colour, arranged in a tree shape on branches sprouting from an edible peduncle. It is a cool weather, slow maturing crop.

Broccoli is harvested when it is uniform in color, from blue-green to green and narrow dome heads that rise above the leaves.

Broccoli can be seeded directly or seedlings can be transplanted into the field.

Broccoli is cooled to about 4.4 °C to lower the breathing rate.
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**PROCESSING OF BROCCOLI – GENERAL ASPECTS**

After harvesting, broccoli are directed to the processing lines:

- **Cooking**
- **Freezing**

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Processing of cauliflower – general aspects

Although a biennial crop, some varieties are grown as cool season annuals, requiring moderately cool climates for growth. The edible portion of the cauliflower is a compact head or curd (thick undeveloped yellow to creamy white flowers), which constitutes approximately 45% of the vegetable (Madhavi and Ghosh 1998; Sanders 2009).

Production

It is customary to hydrocool the curds to 1–5 °C immediately after harvest to remove field heat.
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PROCESSING OF AVOCADO – GENERAL ASPECTS

Avocado is classified as *P. americana*. It belongs to kingdom Plantae, family of Lauraceae, order Laurales, genus Persea, and species *P. americana*. Avocado tree is dense, evergreen, and tall (∼20 m), then fruit is a climacteric and used primarily as a vegetable. Like olives, avocado is rich in monounsaturated fatty acid (oleic acid), health-promoting phytosterols, and phenolic antioxidants.

Avocado trees grow well in hilly sloping land with loose or sandy loam soil.

The avocado is harvested when it is not completely mature (commercial maturity).

Before packaging, avocados are washed, lightly cleaned, sized and classified for quality.
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**PROCESSING OF AVOCADO – GENERAL ASPECTS**

The harvested avocados are washed, slightly cleaned, sized and classified for quality and directed to the processing lines.
Dry beans provide a good source of protein, which is two to three times that of cereal grains, and are a rich source of dietary fiber and starch (Osorio-Diaz et al. 2003). Furthermore they are a good source of vitamins (thiamine, riboflavin, niacin, vitamin B6, and folic acid) and certain minerals (Ca, Fe, Cu, Zn, P, K, and Mg). Dry beans also contain about 1% of polyunsaturated fatty acids, especially linoleic and linolenic acids (Augustin and Klein 1989; Kutos et al. 2002). Finally, they are rich in micronutrient such as phenolics and antioxidant (Amarowicz and Pegg 2008).
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PROCESSING OF DRY BEANS – GENERAL ASPECTS

Canned beans: Canning is the most common processing procedure used to manufacture a variety of beans products. These include beans processed in brine or sauce, in combination with meat stews, chili and the like. Below is showed a flowchart for the preparation of canned beans.

Flowchart of a typical dry bean canning process. Adapted from Downing (1996).
**Processing of Carrots – General Aspects**

Carrot, a fresh season harvest, is grown worldwide. Its color varies from orange to deep red, from light violet to violet, yellow or white. The shape of the carrots makes them easy to handle during harvesting, cleaning, shipping and distribution.

Carrots are grown from seed and take about four months to mature.
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**PROCESSING OF PEAS – GENERAL ASPECTS**

Many plants including certain vegetables (such as peas) produce storage proteins of considerable nutritional importance.

- **Canning**
- **Freezing**
- **Drying**
- **Puree**
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**PROCESSING OF PEAS - CANNING**

A typical commercial pea canning process flowchart is shown.

- **Pea receiving hoppers**
- **Cleaning, washing & grading**
- **Blanching**
- **Washing**
- **Cooling & dewathering**
- **Quality grading**
- **Inspection tables**
- **Brining**
- **Can seaming/closing**
- **Thermal proc. & cooling**
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**PROCESSING OF PEAS - FREEZING**

Fluidized-bed technique is commonly used and has been very successful for freezing peas. The technique is so rapid that peas are brought down to a temperature of 0°C in about 4 min.
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PROCESSING OF PEAS - PUREE

Pea purees are susceptible to color degradation due to heat exposure, low pH and enzymatic activity.

![Chemical structures of chlorophyll a, chlorophyllide a, pheophytin a, pheophorbide a, and phytol.]
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PROCESSING OF ONION AND GARLIC — GENERAL ASPECTS

Onion and garlic are commonly consumed vegetables and they can be found in a number of prescriptions in different traditions and cultures. They are subjected to various processes before consumption.

Onion and garlic processing

- Drying (most common method)
- Distillation
- Maceration in oil
- Hydro-alcoholic short extraction
- Hydro-alcoholic long maceration
Processing of table olives – general aspects

The terms table or edible olives are used for treated or processed olives harvested at maturity. Table olives are available in different shapes, colors, flavors and tastes.

- Spanish-style green olives
- American-style black olives
- Greek-style black olives
- Kalamon-style Greek olives
Processing of Table Olives – Spanish-style Green Olives

The terms table or edible olives are used for treated or processed olives harvested at maturity. Table olives are available in different shapes, colors, flavors and tastes.

- **Spanish-style green olives**
- **American-style black olives**
- **Greek-style black olives**
- **Kalamon-style Greek olives**
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**PROCESSING OF TABLE OLIVES – AMERICAN-STYLE BLACK OLIVES**

The terms table or edible olives are used for treated or processed olives harvested at maturity. Table olives are available in different shapes, colors, flavors and tastes.

- **Spanish-style green olives**
- **American-style black olives**
- **Greek-style black olives**
- **Kalaman-style Greek olives**
Processing of table olives – Greek-style black olives

The terms table or edible olives are used for treated or processed olives harvested at maturity. Table olives are available in different shapes, colors, flavors and tastes.

- Spanish-style green olives
- American-style black olives
- Greek-style black olives
- Kalamon-style Greek olives
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**PROCESSING OF TABLE OLIVES – KALAMON-STYLE GREEK OLIVES**

The terms table or edible olives are used for treated or processed olives harvested at maturity. Table olives are available in different shapes, colors, flavors and tastes.

- Spanish-style green olives
- American-style black olives
- Greek-style black olives
- Kalamon-style Greek olives

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**PROCESSING OF TOMATO – GENERAL ASPECTS**

Tomato is a versatile vegetable from which a variety of processed products are produced.

- Juice
- Pulp
- Canned
- Powder
- Soup
- Ketchup
- Dried
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**PROCESSING OF TOMATO – TOMATO PULP**

Tomato pulp is obtained from ripe tomatoes, selected and processed immediately after harvest.

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<table>
<thead>
<tr>
<th>Fresh tomato</th>
<th>Extraction &amp; juice refinning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grading</td>
<td>Concentration</td>
</tr>
<tr>
<td>Soaking &amp; washing</td>
<td>Finishing</td>
</tr>
<tr>
<td>Sorting &amp; trimming</td>
<td>Filling &amp; processing</td>
</tr>
<tr>
<td>Break</td>
<td></td>
</tr>
</tbody>
</table>
```
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**PROCESSING OF TOMATO – CANNED TOMATOES**

Canned tomatoes are peeled fruits that are processed by heat and then sealed into a can.

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**Flowchart:**

1. **FRESH TOMATO**
2. **CLEANING, WASHING & GRADING**
3. **FILLING**
4. **ADDITION OF CALCIUM SALT**
5. **EXHAUSTING & SEALING**
6. **THERMAL PROCESSING**
   - **COOLING**
   - **LABELLING**
   - **PACKAGING**
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**PROCESSING OF TOMATO – TOMATO JUICE**

Tomato juice is a juice made from tomatoes, unconcentrated and pasteurized and usually used as a beverage

- Fresh tomato
  - Grading
  - Soaking & washing
  - Sorting & trimming
  - Break
- Extraction & juice refining
  - Deaeration
  - Salting & filling
  - Homogenization
  - Packaging
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PROCESSING OF TOMATO – DRIED TOMATO

Dried tomato are usually treated with antioxidant before being placed in the dryer in order to improve quality.

1. Fresh tomato
2. Grading
3. Soaking & washing
4. Sorting & trimming
5. Cutting & drying
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**PROCESSING OF TOMATO – TOMATO KETCHUP**

Ketchup is a sweet tomato sauce primarily made from tomatoes, sweetener and vinegar.

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FRESH TOMATO

GRADING

SOAKING & WASHING

SORTING & TRIMMING

BREAK

EXTRACTION & JUICE REFINNING

CONCENTRATION & FORMULATION

COOK & FINISH

HOMOGENIZATION & DEAERATION

STERILIZATION & PACKAGING
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Processing of tomato – Tomato powder

Tomato powder is one of the most versatile ingredients, used in many recipes.
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**PROCESSING OF POTATO – GENERAL ASPECTS**

French fries, potato chips, dehydrated, canned potatoes and extruded potatoes are the major potato products.

- Frozen french fries
- Dried potato
- Canned potato
- Potato chips
- Extruded potato
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**PROCESSING OF POTATO — FROZEN FRENCH FRIES**

Frozen french fries are potato for use by fast food and ready-to-eat food outlets and restaurants.
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**PROCESSING OF POTATO – DRIED POTATO**

The dehydrated products are used in dried or canned soups and stews, potato salads, casseroles, hash browns, extruded snack foods, mixes for dumplings and potato pancakes, as breading or as corn meal replacement.
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**PROCESSING OF POTATO — CANNED POTATO**

Potatoes suitable for canning do not easily disintegrate or slough during processing.
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**PROCESSING OF POTATO – POTATO CHIPS**

Potato chips are thin slices of deep-fried potato of about 2% moisture that come in a variety of Flavors.

- Frozen french fries
- Dried potato
- Canned potato
- Potato chips
- Extruded potato
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**PROCESSING OF POTATO — EXTRUDED POTATO**

Potato chips can also be made via a process based on extrusion of rehydrated potato powder.
References (papers)


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References (papers)

References (papers)

References (books)