Teaching Materials
for Qualification of Specialists in Traditional Orchards

MODULE: PROCESSING AND MARKETING

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Lifelong Learning

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Teaching unit 1: Apple juice variant

Learning aims

He/she knows

- methods of juice production

He/she is able

- to provide basic information on the composition of the juice

Methods

Begin creatively through blind tasting

A discussion to evaluate

Content

- Different types of juices
- Concentrate
- Pure direct Juice (not-from-concentrate)
- Unfiltered direct juice (not-from-concentrate)

Coordinator

Organisation

10 days before
Preparing the towels

2 days before
Preparing different types of juices (juice variants)

1 day before
Providing glasses or bowls

Praxis

Preparation

Filling glasses with samples of different apple juices for the blind tasting, and laying out towels for use as blindfolds.

First the tasting will be demonstrated by teaching staff.

Duration

30 Minutes

Location

Seminar room

Season

Feasible during the whole year

Tasks

Students are divided into pairs. Each pair carries out the blind tasting together. One student covers the eyes of his/her partner and helps him/her to taste the different juice samples.

The results of the tasting and the different types of juices are discussed. The students talk about their experiences and knowledge of juice production.

Remarks

It is important to make a good distribution of the pairs throughout the room to help concentration.

Materials

Different samples of juice (concentrate, pure not-from-concentrate juice, unfiltered not-from-concentrate juice), glasses, towels for covering eyes for blind tasting

Equipment

Tables
Armchairs

Supportive documents

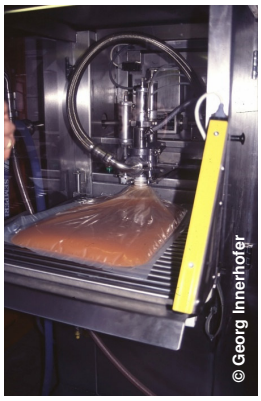
Knowledge base

Fruit juice – Knowledge base

Direct (not-from-concentrate) juice or fruit juice concentrate?

There are two main types of fruit juice. On the one hand there is a so-called "direct or not-from concentrate (NFC) juice" and on the other hand the one produced from the "juice concentrate". Both have 100% non-diluted fruit content.

The term "direct or NFC juice" or "made from fruit concentrate" on the label explains how the juice was produced. The juice is either contained in cloudy or clear bottles after juicing or stored for later filling in sterile tanks. This is the usual on-farm method.



In order to get a fruit juice concentrate, the freshly squeezed juice will be dehydrated under vacuum conditions, until the juice is reduced to about one-sixth of its volume. After reconstitution with clean drinking water there will be a fruit juice with 100 percent fruit content again. The use of concentrate must be noted on the product label. The processing of concentrate has no relevance in on-farm fruit juice production.

For an industrial juice producer it has several advantages, which are crucial due to the low consumer prices of redilluted juice. The manufacturers can achieve higher storage capacities, and they can spread the filling evenly over a longer period and thus compensate for years with poor fruit harvest through storage reserves.

Teaching Unit 2 Apple juice: Theory and processing

Learning aims

- Please see the curriculum sheet Unit 7/TU 2

Method

Short presentation (Powerpoint)
Practical exercise

Content

- Selection of the fruit for pressing
- Content substances of apple juice
- Necessary additives
- Repetition of the basic techniques of juice pressing
- Processing of the directly presse dapple juice (clear and unfiltered/cloudy)
- Preservation of juices

Coordinator

Organisation

30 days before:
Order fruit for pressing and review the necessary equipment. Organise an excursion according to demand
20 days before:
Order bottles and cups
1 day before:
Prepare pressing fruit, equipment and tools

Praxis

Lecture

Repetition of the basic concepts of apple juice pressing. Lecture about the basic techniques of processing of directly pressed apple juice.

Duration

8-9 Hours

Exercise

Preparations

- Providing materials and tools
- Presentation of apples of different quality
- Presentation of different juice samples (clear, cloudy)

Location

Workshop room

Season

Autumn

Tasks

The basic techniques are presented and demonstrated by teaching staff. Students work in small groups.

Repeating the pressing: The quality of the pressing fruit is controlled and discussed. The fruits are cleaned, crushed in a grinding mill and pressed with a hydraulic press. The juice is processed in two variants.

Production of the cloudy/unfiltered direct juice: The freshly squeezed juice is bottled directly from the press into bottles. Then the juice is pasteurized in the combi-steamer.

Production of clear direct juice: The juice is directly pressed and filled into a tall glass. Thereafter the enzyme treatment, protein stabilisation, and clarification/fining follow. Finally, the juice is vacuumed, filtered, bottled, and pasteurised.

Remarks

The two processing methods (cloudy and clear juice) are executed one after the other. The waiting time during the processing of the clear juice can be used for breaks and for the development of labels (see picture TU 3).

If no fruit press were available, performing an excursion would make sense. Possible locations are agricultural universities, juice and cider presses, and mobile presses. There the students should have the opportunity to participate in as many working steps as possible.

Materials

Apples, pectolytic enzyme, bentonite, gelatine, bottles, and caps

Equipment

Grinding mill, hydraulic press, combi-steamers, filters, big glasses for fining

Supportive documents

Info sheets:
Pressing
Cloudy (not filtered) juice
Clear juice

Knowledge base:
Processing of the fruit juice

Results

Bottled cloudy and clear apple juice

Info sheet: Pressing

Method / Working steps	Material / Tools	Important
Selection of fruit	App. 50 kg of press fruit	The fruits must tob e fresh, ripe, healthy and clean
Crushing	Grinding mill	
Pressing	Hydraulic press	

Notes

Info sheet: Cloudy juice

Method / Working steps	Material / Tools	Important
Direct filling	Bottles, caps	Bottles must be clean and free of dust
Pasteurisation	Combi-steamer	At 80°C
		

Notes

Info sheet: Clear juice

Methods / Working steps	Material / Tool	Important
Enzymation Stirring in the enzyme	Pectolytic enzyme	Minimum juice temperature of 12 ° C, Standing time of 2 hours
Protein stabilisation / bentonite fining After pre-swelling with water, the aliquot amount of bentonite is stirred and mixed in from above.	Bentonite	Correct pre-swelling processing of betonite After 15 Minutes stir well for an adequate reaction, Standing time of 30 minutes
Clarification/ Gelatine fining Stirring in the Gelatine	Gelatine	
Filtration	Hopper filter	
Pasteurisation	Combi-steamer	At 80°C

Fruit Juice Production - Expertise

Requirements and preconditions

There are certain minimum requirements for equipment and receptacles in fruit processing. Over the past few years, fruit processing equipment has changed considerably. Factors, such as industrial safety or process measuring and control technologies, were accompanied by massive utilisation of new materials; virtually all areas of engineering and machine construction are nowadays dominated by stainless steels and synthetic materials.

Grinding and Crushing Equipment

The first Step, after having selected and cleaned fruits, most commonly is mechanical crushing, regardless of the following steps, which may be squeezing, straining, sieving, cooking etc. For this procedure, numerous devices are readily available. Depending on the production steps to follow, as well as type of machine and adjustment, fruit will be shred or broken up to different degrees. Rather than making the next step the finest, the best possible degree of comminution should be found.

In order to allow juices to discharge, fruit are ground before further processing. All implements, too large in size, reduce the average juice extraction. On the other hand, all mash, too fine will be a serious obstacle in separating solids from liquids. Juices will contain quantities of turbid materials and thus be hard to clarify and decant. The squeezing cloth, used as a filter in this process, will become clogged, leading to increasingly insufficient juice outflow. Those juices contain turbid, a serious obstacle to the final clearing. In mash fermentation, those fine mashes are not considered a disadvantage.

Shredding equipment can be built to different standards, but is normally found as a fixed unit of shredder/mill and squeezer, liberating the operator from having to shift mashes to the squeezing unit.

Pivoting centrifugal mills (grating mills)

Those operate, following a principle similar to that of centrifugal grinders. There core competence is foremost found in the comminution of all pomaceous fruit. Inside, fruit are pressed to the outer edges, utilising a rotor-shaped armature, where they are ripped apart by serrated cutting teeth. Those cutting teeth are interchangeable in accordance to the desired reduction ratio. This kind of shredder is inappropriate for processing stone fruit, drupes or soft fruit.

Straining and Juicing Equipment

Purpose and target of juicing and straining is the separation of liquids from solids. Short juice distances, low pressing force and avoidance of oxidation-related brown-stains an changes of aroma by means of swift processing are crucial factors for the final juice quality.

Nowadays, there are myriads of different straining systems. Most of them originally developed for winery; those capable of fruit processing have been adapted accordingly.

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Hydropresses

Hydropresses have capacities of up to 200 litres and thus aim at rather small juice productions. They are excellent for speciality and custom productions, impossible to manufacture with other types of strainers and juicers. Their production quality is excellent, owed to gentle processing.

A typical hydropress is built on a metal stand, with a vertically mounted cylinder, cylindrical hose or bellow on top. The gap between bellow and outer wall of the cylinder is filled with mash and subsequently closed with a lid. During the squeezing process, water pressure widens the bellow, widening it beyond its outer limits, pressing the mash towards a perforated wall, leading the juice flow. To prevent this sieve from getting clogged, it may be covered with a pressing cloth.

Naturally cloudy, unfiltered Juices

For the production of clear juices, filtration of all turbid is inevitable, whereas in naturally cloudy juices the preservation and stabilisation of those particles, forming turbid is highly desirable.

In central Europe, mainly apples and grapes are or processed as naturally cloudy juices or blends. Because of their constituents, fruit, other than those, are not as easily processed into naturally cloudy juices.

Freshly squeezed apple juice contains certain agents (foremost pectin) increasing its viscosity on one hand, but on the other hand leading to electrical molecular bonding and thus are responsible for a relative physical stability of the juice, preventing turbid from falling out and settling. Bringing as much of a fruit's pectin as possible into the juice is highly desirable.

Large quantities of pectin form gel, as observed in jams and marmalades. Smaller quantities lead to insignificant thickening. Juice is slightly thicker, turbid doesn't settle as easily. Apart from that, pectin forms a kind of shield around turbid, additionally preventing fallout and settling.

Naturally cloudy, unfiltered apple juice

Fruit selection and the appropriate technology determine turbid intensity and its stability.

- *Unripe apples* have exceptionally high pectin contents. During the squeezing process, however, the pectin is held back with the pomace, insolubly bound in long chains and thus does not transfer into the juice. Furthermore, unripe fruit lack aroma and sugar. Pressing unripe fruit harms the overall quality of the juice.

- Whereas *Fully ripened apples* present high contents of soluble pectin which during the pressing process transfers into the juice, increasing viscosity and turbid stabilising.

  Long-chained pectins are partially eliminated, also leading to softer apples. Squeezing transfers higher pectin contents into the juice.

  Fully ripened fruit present high sugar contents and fully developed flavours and thus are best for processing.

- *Overripe apples* are inadequate for the production of naturally cloudy juices. Their relative softness is an obstacle to proper squeezing. Mushy constituents frequently get into the juice and can later be found at the bottom of the bottle. Following the apple's natural ability to withdraw pectin by means of enzyme, overripe apples present low or now pectin contents. Juices drawn from overripe fruit are inappropriate for the production of naturally cloudy juices.

- *Mouldy or rotten fruit* shall not be used. Due to active micro organisms, they contain high quantities of pectin-reducing enzyme, causing oxidation. Their use will negatively affect flavour and turbid stability.

- *Variety Selection* is of equal importance. Pippin- or dessert apples in general present higher turbid contents than cider apples. Many times, cider varieties have high contents of natural tannin agents, leading to flaky oxide dropouts, which settle on the bottle's bottom. Those are inadequate for producing naturally cloudy fruit juices.

Processing

Turbid is formed of cellular modules from the cell's wall and its membrane, also precipitation due to distortion of the fruit's structure. The quantity of cellular elements in the juice depend on the mechanical force during grinding, transport and straining.

Large turbid quantities lead to undesired residues at the bottle's bottom. Gentle processing will increase the likeliness for low turbid contents. Vigorous processing will increase turbid quantities. Juices with a large stability in their turbidity can only be drawn from clean and healthy fruit.

Common procedures

The easiest method is direct pasteurisation, immediately upon discharging juices from the squeezer. Providing gentle pressing of perfectly structured apples, this will work very sufficiently. Should there be higher turbid contents, it is recommendable allow a few hours for those suspended particles to settle. Following this step, the juice will be drawn by means of a drain hose, then heated and bottled. During the resting period there is a slight danger of natural enzyme damaging parts of the pectin content. (Especially true at higher temperatures). Thus there is an increased danger, especially with overripe fruit, that after the pressing undesired clearing takes place. This method can only be recommended for perfectly clean starting material and low juice temperatures. It may make sense, to cool Apples before their squeezing.

More advanced methods, such as flash pasteurisation or employment of a centrifuge are pretty much reserved to bigger businesses.

Oxidation Protection

Species, degree of ripeness, as well as juice temperature have tremendous influence on the likeliness to oxidants causing mash and juice to turn brown. Species and their individual juice composition determine the degree of browning. Overripe fruits brown significantly more than those, fully ripe. The same applies to the juice temperature; the warmer and the longer it rests, the more intense the browning reaction.

To assure a light colouring under all circumstances, ascorbic acid is added immediately upon Pressing. Slight browning will vanish under the influence of 150 mg/l ascorbic acid; the juice will subsequently be protected against undesired browning. Apart from its brightening function, ascorbic acid has positive effects, stabilising turbidity. Higher doses between 200 and 500 mg/l may exceptionally be used to fulfil certain specifications. Under the influence of those higher doses, juices will become very light to almost white.

Turbid Depot

Even under highest technical standards, flaky residues and lump formation at the bottle's bottom can't be completely eliminated.

Under most circumstances those compounds result from bonding of natural tannins and proteins. In most cases they are easily diluted by means of shaking. Insoluble lumps will quickly settle on the bottle's bottom. In some cases, consumers will reject to those juices, but in most cases they know, that turbid doesn't mean a deterioration of quality or flavour.

Being a clear indicator for a natural product, this ultimate remainder of fruit residues can be neglected. In juice production not everything is predictable and foreseeable.

Clear fruit juice

Having selected appropriate fruits, these are cleaned, chopped and strained. There should be the least possible time gaps between those production steps, in order to give micro organism growth and oxidation as little time as possible. Oxidation protection is extremely desirable with juices with a high likeliness to brown, as well as to obtain very light coloured juices.

Treatment agents – Embellishment

In accordance to the fruit, originally used, after the straining process variations in the degree of turbidity will be observed. Even with low turbid juices, filtration at this production stage would be inefficient. Thus in order to reach a cosmetic clearing, the addition of clearing agent is the most common method to start the clearing process.

As seen in detail in the unit on treatment agents, a a clearing will be most successful at a temperature of 12 °C. At lower temperatures, the straining process should only be started if there is an option for heating the juice, best be achieved with a tubular heat exchanger.

Oxidation Protection

In most cases, fruit juices will be of a pleasant light colour, after the clearing process. Overripe fruits, meaning not completely satisfactory raw material, however, as well as time-consuming production procedures, may lead to undesired browning reactions in the juice. The browning intensity varies in accordance to the processed variety, temperature, ph-value, total acidity and also air admittance. Some species are very prone to browning, whereas others aren't.

To prevent juices from browning from the beginning, L-ascorbic acid may be added. This can be done either directly after the pressing or later in the tank. Under normal circumstances, for apple- or pear juice, between 150 and 200 mg/l are added. Treatment with higher doses or treatment of very light juices will lead to almost watery light juices. Most consumers would consider those untypical; thus overdosing or dosing without previous indication should wilfully be neglected.

Enzyme treatment

BTo initiate the clearing process, a pectolytic enzyme is utilised. Addition of pectolytic enzyme accelerates the reduction of the turbidity stabilising pectin shell, the juice's viscosity is reduced and turbid begins to form sediments.

In the tank flocculating should be observer just minutes after the enzyme was added. Any obstacle to enzyme treatment can make the clearing process very difficult, as dissolved pectin raises the viscosity, hindering turbid to settle.

If pectolytic enzyme was added to the mash, this step doesn't necessarily have to be repeated with the juice. To have reliable feedback on the pectin degradation, a pectin test can be utilised. 5 ml of juice and 5 ml of pure alcohol are mixed in a test tube. Should flocculation occur, this is considered a clear indicator for insufficient pectin degradation; before clearing a second batch of enzyme has to be added.

The enzyme's application rate varies in accordance to the individual product and its application. It is normally indicated on the packaging. Overdoses don't deteriorate the flavour but can be an unnecessary expense.

Utilisation of starch breaking enzyme is only indicated for processing unripe apple at the beginning of the season.

Protein Stabilisation

Protein is a natural ingredient of all fruit. It doesn't deteriorate fruit processing. It isn't until pasteurisation that it causes flocculation under heat treatment, causing turbidity, which can be observed as cellular striation. This form of cloudiness does not influence flavour or shelf life, but is considered impairing and undesirable.

Heat sensitive proteins will thus in the process be removed from the juice. There are two common methods of removing proteins.

Cosmetic Bentonite Treatment

Bentonite's effectiveness is significantly determined by means of proper soaking. Increasing the layer distance will enhance negative charges, whereas positively charged proteins will attach themselves to the bentonite.

After soaking in water, bentonite is emulgated with a specific part of the juice and subsequently added to the remainder, approximately two or three hours after the enzyme, best done from above. Ater about 15 minutes, the container has to be stirred once more.

High-Temperature-Short-Time Procedure

High- short heating is of little or no influence for plain, direct juices, with the exception of manufacturers storing the juice in sterile "KZE" containers.

Cosmetic clarification – gelantine clearing

The clarification of fruit juice is dominated by the utilisation of powdered gelatine, which is cheaper to procure, has a longer shelf-life and is more effective. Liquid gelatine solution is easier to use, with a shorter shelf-life and more expensive.

Approximately 30 minutes after the bentonite has been stirred into the juice, the gelatine can be added to the juice. It has to be stirred into the juice in order to achieve a homogeneous tank content. Agitators with bigger wings and slow action will work better than small propellers with rapid rotation. With their slow motion, they are more likely to disaggregate any flocculation.

Silica-gelatine clearing

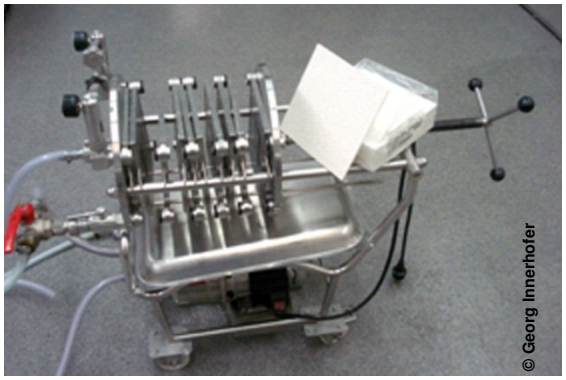
The addition of silica will permit gelatine residues to vanish from the juice, which would later cause sediments to form clouding. Furthermore, silica will increase tarnish compactness.

Estimates for cosmetic clearings

150 g bentonite
15 g gelatine (75 ml dissolution)
75 ml silica (concentration 30 %)

These estimates refer to 100 litres of apple juice from ripe fruit, following adequate enzyme treatment.

Filtration



In most cases, cosmetic treatment on its own is not sufficient, in order to maintain clear or bright juice qualities. Thus, all cosmetic treatment is normally flanked by a filtration process and finally completed by heat treatment and bottling. In general, hot-filling following diatomite filtration will make sterilisation obsolete.

Preservation

In order to preserve fruit juice, in general pasteurisation (hot-filling) is the most common quality-determining method. Apart from the overall temperature, its duration is of tremendous significance.

Total temperature and duration of heat impact determine the effectiveness of the sterilisation process.

Natural cloudy juices, due to their higher enzyme contents and thus higher plate count, should be bottled at a minimum temperature of 80 °C. Pasteurising equipment lacking exact temperature control are prone to failure. Temperatures, exceeding this will harm colour, flavour, as well as important ingredients, e.g. vitamins.

Hot-filling

Hot filling is the best known method for the preservation of non-sparkling (devoid of carbon dioxide) drinks. It is employed at temperatures, lower than 100 °C and therefore is known as one method, known as pasteurization. Bacteria, which later could cause spoilage, are eliminated by means of heat.

Nectar or syrup bottled cold (at room temperature) will transport harmful germs, drawn from the fruit, the equipment or the bottles, which will soon cause fermentation or mould. This will not easily happen with hot-filling.

Hot-filling

- eliminates micro-organisms in the beverage
- eliminates micro-organisms in the bottle
- inactivates the fruit's enzyme

Though sensitive to high temperatures, micro-organisms won't fall off immediately after reaching a certain temperature. The extent of depletion is highly dependent on temperature and duration of heat treatment. The higher the temperature and the longer it is held, the more micro-organisms will be eliminated.

Thus, it is a matter of choice, to heat in the 60 °C region for a period of hours or in the 80 °C region for just a few minutes. The effect on the product's shelf life is the same. But the loss of vitamins, freshness and fruitiness is significantly higher with the long-heat approach.

Heating to 80 °C will also change and inactivate enzyme. Those would lead to a substantial decrease of colour and aroma; produce containing fruit pulp would undergo a quick reduction of turbid. Once processed, turbid is not considered an increase in quality, nor to have positive effects on the nutritional properties of the juice. As opposed to this, the elimination of enzyme is inevitable for an extended shelf-life.

Bottles or lids don't have to be sterilised, heated or treated against germs by any means before filling. A visually dust free cleanliness will do. The heated juice will complete the antibacterial effect.

Teaching unit 3 Apple Juice: label design

Learning aims

He/she knows

- the requirements of fruit juice labelling

Method

Creative designing of labels
Using information from info sheets

Content

- Guidelines for the designing of labels of fruit juice products

Coordinator

Organisation

2 days before:
Provide self-adhesive labels and poster pens
Print pictures

Practice

Preparation

- Printing of pictures to topics around apple juice and labelling

Demonstration

- Presentation of templates for correct labelling

Duration

2 Hours

Location

Seminar room

Season

Autumn

Tasks

Each student receives the info sheets on label design and designs independently a label for his / her self-pressed apple juice.

Remarks

The designing of the posters is carried out during the standing time (after the enzyme treatment). Finally they are stuck on filled juice bottles.

Materials

Self-adhesive labels, pens, paper in various colours, glue, pictures of apples

Equipment

Working tables, armchairs

Supportive documents

Info sheets
Label - front
Label - back
The information on the beverage label

Results

One label per student

Info sheet: Label - front

Info sheet: Label back

Info sheet: Necessary information on the beverage label 1/2

The product name

The product name specifies what is in the bottle or package. This can be, for example, apple or orange juice. If the juice is from concentrate, this must be stated in the product name. The direct juice does not have to be separately declared, but mostly it is specified as a quality feature.

The minimum fruit content

In case of nectar, whether fruit or vegetable nectar, the minimum fruit content must be specified with the percentage. In case of 100% fruit juice and fruit beverages, an indication of the minimum fruit content is not compulsory.

The filling capacity

The indication of the filling capacity is written in litres and must be present on each label. It serves mainly for the price comparison between products.

Name, company, address

Each label must necessarily contain the name, the company identification, and the address of the producer, packer or seller. This is required by law.

The list of ingredients

This list contains the fruit types used and other ingredients of the product. If the product contains only one ingredient (such as apple juice), the list of ingredients can be omitted. Fruit juices contain namely 100% of the name-giving fruit and no other additives. If several ingredients in a product are included, they will be ranked according to their share in the product. For example, in pear nectar, "water, pear juice, sugar." If on the label of a drink, one of these ingredients is highlighted (mentioned by name, photo, etc.), its share must be specified in percentage. This can be done either in the product name or in the list of ingredients, and must be additionally cited except the information about total fruit juice content.

Info sheet: Necessary information on the beverage label 2/2

The expiration date

This reflects the date by which the ingredients and quality characteristics of the product are retained in any case. Exceeding of this limit does not necessarily mean that the product is undrinkable.

The batch mark

The batch mark identifies a food in more detail. Through this mark, more information about the producer, the exact date of production and much more product information can be found out. It typically starts with "L" and consists of a combination of letters, numbers, or both. The batch mark is not compulsory and can be replaced by the expiration date.

The EAN code

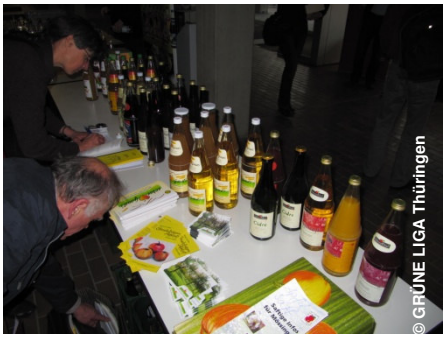
This code is also known as the barcode, which allows an automatic reading in a storage- or POS systems. The appearance of this code is standardized in order to ensure that the code can be recognized by all reading devices. The EAN code and the corresponding number of goods are unique in Europe for each product. The installing of this code is optional.

Teaching Unit 4 Apple juice: Competitive Juices

Learning aims

He/she is able

- to explain the nutritional and dietary properties of fruit
- to choose the right procedures for the production of fruit juice
- to provide basic information on the composition of the juice (consolidation)



Method

Business game

Content

- Advantages and disadvantages of juice variants
- Quality labels of juices

Coordinator

Organisation

1 day before

Development of info cards

Practice

Preparation

- Develope info cards for three groups

Duration

2 Hours

Location

Seminar room

Season

Implementation possible at any time

Tasks

Students are divided into four groups and receive an info card with their character/product. One group has the role of the jury.

Each group prepares the presentation of its apple juice. These can be designed individually. To stimulate of ideas, the argumentation aid can be used. In the meantime the jury develops categories for evaluation.

Remarks

Ideally, each group has its own separate place for preparation.

Materials

Paper, poster sheets

Supportive documents

Info sheets
Role playing cards
Argumentation aids
Quality labels

Knowledge base TU 1 – 3

Results of each group

Each group presents their product, aiming to win the competition. The jury awards points in various categories and votes for the winning group.

Info cards 1/2

Organic farmer Xaver Appleluck has several traditional orchards on his farm with different apple varieties. In the future he wants to produce different apple juice specialties from the directly pressed apple juice. Mr. Appleluck is convinced of the health benefits of "naturally cloudy" juice. In addition, he is strongly committed to the conservation and maintenance of traditional orchards.

Lifelong Learning

The fruit grower Horst Sheepnose took over a fruit farm from his parents. On his farm there are traditional orchards and also classic apple orchards/plantations. He has pressed apple juice for years. Mr. Sheepnose is convinced that only directly pressed clear apple juice can be sold. He is not convinced about certificates and organic regulations.

Lifelong Learning

Info cards 2/2

The company Smokeleft would like to increase the sale of their juice from concentrate in Europe in the future. They are convinced that the consistent taste will impress and satisfy customers. Of course they can offer their juice for an unbeatable price. Additionally, they are trying to lure customers in with certificates.

Argumentation aid

Advantages of:

- **Juice from concentrate**
  - It is cheap.
  - It can be easily transported.
  - It requires little storage space.
  - It can be produced independently of the harvest season.
- **Direct juice - clear**
  - It looks well-known, but is of a higher quality.
  - It is easier to make it because there is no concentration necessary.
  - There are no additives supplemented.
  - It tastes better than concentrate.
- **Direct juice - unfiltered**
  - It is the healthiest juice (antioxidants).
  - No filtration is necessary.
  - It is "something special" as it is still offered rarely.
  - It has the strongest flavor and the most complex diversity of aromas.

Possible categories for assessment:

- **Persuasiveness** (quality of arguments, credibility ....)
- **Design** (Innovative, creative, boring ...)
- **Content** (facts, comprehensibility …)

Quality labels for juices 1/2

Quality labels should point to the special qualities of products, e.g. their health, social, or ecological characteristics. They serve to distinguish between products with the same purpose of use, and nowadays they are an important market information tool.

Name	Label	Description
EU eco label for organic production		The EU label for organic production is the EU-wide indicator for products from organic farming. It considers a wide range of environmental, health, social, technical and ethical aspects throughout the entire life cycle. Beginning with the production and processing to completion of the final product.
From NABU recommended, because of traditional orchard products *NABU – The Naturschutzbund Deutschland (Nature and Biodiversity conservation Union)		The NABU-quality label indicates high-quality and largely pollution-free traditional orchard products. The objectives of the NABU-label are maintaining and supporting active nature conservation, as well as the sustainable use of natural resources and regional marketing. However, in the case of this label it is irrelevant whether the cultivation is realised according to organic principles or not.
Demeter		The "Demeter" trademark is evidence of a high environmental standard relating to the production and processing of organic agricultural products. The guidelines of the Demeter society go far beyond the legal requirements of the EU Organic Regulation.
GMO-free (produced without GEN-technology)		All those foods that have been produced "GMO-free" in the sense of the EC-Genetic Engineering Implementation Act may carry the sign "GMO-free". Ingredients or additives from genetically modified plants are entirely prohibited. All organic products are automatically GMO-free even without this label.

Quality labels for juices 2/2

Name	Label	Description
Protected Geographical Indication (PGI)		If at least one step in the production chain of the goods is placed in one of the registered regions, the PGI label can be put on the final product.
Protected Designation of Origin (PDO)		The label PDO can receive a product only if the entire production process took place in one single region. The PDO-label for identification of regional quality production goes beyond the legal regulations.
Fair Trade		The Fair Trade label considers mainly social criteria, but in further consequence it also takes environmental aspects into account. The guidelines go beyond the set standards and look at the development of one product from the production conditions to trade flow.
V – Vegetarian		With the V-label vegetarian and pure plant products should be easily recognisable. Furthermore, through this the market for vegetarian products should be encouraged and strengthened.

Fruit Juice Production

ESTO

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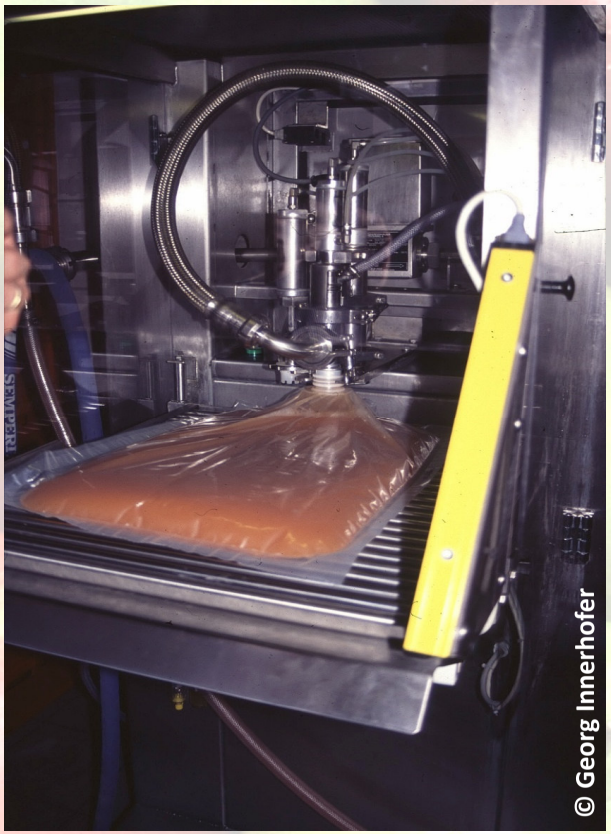
Contents

- Direct juice or concentrate
- Processing unfiltered juice
- Processing clear fruit juice
- Preservation

Direct juice or concentrate?



Direct juice or concentrate?

Direct juice

- Small quantities
- Family / small enterprise production

Concentrate

- Large quantities
- Industrial production

Naturally cloudy fruit juice

Selection of fruits for processing

- Fully ripe apples – ideal
- Unripe apples - not ieal!
- Overripe apples - not ideal!
- Rotten apples - unusable!

- Choosing the right variety is crucial

Naturally cloudy fruit juice

Naturally cloudy fruit juice

Production stages

- Pressing
- Oxidation protection

Naturally cloudy fruit juice

Source material

- Fresh
- Ripe
- Healthy
- Clean

Naturally cloudy fruit juice

Production process

- **Directly from the press**

  Further processing directly after pressing

- **After resting**

  Further processing after resting and settling in tank

Naturally cloudy fruit juice

Oxidation protection

- Factors influencing browning
- Antioxidant used - L-ascorbic acid
- Dosage 150-200mg / l

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Naturally cloudy fruit juice

Trubid depot

- Clouding = natural product

- No deteoriation in quality

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Clear fruit juice

Clear fruit juice

Production stages

- Pressing
- Oxidation protection
- Enzymation
- Protein stabilisation
- Clarification
- Filtration

Clear fruit juice

Enzymation - settling of turbid

Procedure:

- Addition of pectolytic enzyme
- Monitoring Pectin
- Addition of starch-degrading enzymes

Clear fruit juice

Protein stabilisation – avoiding striation

Procedure:

- Addition of a bentonite fining
- Processing by high-temperature short-time process

Clear fruit juice

Clarification

- Gelatine fining

- Silica – gelatine fining

Clear fruit juice

Approximate figures for clafitication

- 150g betonite
- 15g gelatine (75 ml solution)
- 75 ml silica sol (30 %)
- for 100 l apple juice from ripe fruits

Clear fruit juice

Filtration – Removal of residual turbids

Procedure

- Kieselguhr filtration (diatomaceous earth filtration)
- Subsequent direct bottling

Preservation

Pasteurisation

- Temperature ~80°C
- Temperature hold time ~5-10 min

Preservation

Hot filling

- kills micro organisms in the drink,
- kills micro organisms in the bottle,
- inactivates enzymes in the fruit

Thank you!

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ESTO – European Specialist in Traditional Orchards	
PROCESSING & MARKETING	Unit 7
Producing fruit juice	L 4

KNOWLEDGE

He/she is able to

1. describe ingredients and nutritive value of fruits and fruit juice (from old varieties)
2. explain changes of compounds while processing
3. explain the impact of variety and harvest date on the quantity and quality of fruit juice
4. determine the most important requirements on room, equipment and procedure necessary for juice production (mashing, squeezing, clarification, pasteurization)
5. explain methods and recipes of juice production
6. determine the most important microorganisms for juice production
7. explain the principles of microorganism-growth and -prevention
8. describe the general techniques of juice conservation
9. explain hot filling technology
10. analyse the demands of labelling fruit juice

SKILLS

He/she is able to

1. give basic information about the composition of the juice
2. explain the nutritional and dietary properties of fruit
3. choose suitable fruit species and varieties for juice production
4. define the perfect harvesting date
5. discard unusable fruits
6. choose the appropriate method and machines for fruit juice production
7. use machines correctly
8. apply given recipes and adapt them if necessary
9. find further information about machines and equipment (research)
10. choose appropriate conservation methods

COMPETENCES

1. He/she produces fruit juice autonomously and on own responsibility with a given or a varied recipe and method.
2. He/she selects and applies appropriate technology to fruit juice production.
3. He/she autonomously realizes hazards in juice production and takes measures against these hazards if necessary.

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