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Meeting

29th International Meeting Quality Control Fruit and Vegetables, 25 – 27 February 2013, Bonn, Germany
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Speakers
Ladies and Gentlemen,

it is my pleasure, on this beautiful Monday, to welcome you warmly to Bonn – also on behalf of Dr. Eiden, the President of the Federal Office for Agriculture and Food.

We have come together today for the 29th time. The International Meeting on Quality Control Fruit and Vegetables gathers 220 experts from 22 countries and demonstrates, once again and quite impressively so, that quality control is alive and quite active as well. 15 out of 27 EU member states are represented here. In addition, we are glad to welcome colleagues from Chile, Ghana, Malaysia, Morocco, Russia, Switzerland, Turkey and the USA.

During the days ahead you shall touch upon an interesting range of subjects regarding the offer of fruit and vegetables. You shall deal with issues relating to quality basics – to production – but you shall also discuss related problems and their consequences – namely rejections in the framework of conformity checks.

You shall use the opportunity of this forum to exchange information. You shall agree on adequate and technically well-founded interpretations of marketing standards and rules for controls to make sure that such rules and regulations are applied uniformly and in a coordinated manner. In short: You continue to build and expand your network which strengthens the enforceability of your controls.

I have no intention of hiding the fact that in Germany – and probably not only here – people strive to determine to what extent rules can be reduced to a minimum in order to minimise the burden of government controls on both administration and the industry. This includes discussions, here in Germany, of whether or not official requirements regarding fruit and vegetable quality and characteristics should or could be abolished altogether, to give consumers a chance to buy lesser quality at moderate prices.

The most recent scandal around the fact that cheap horsemeat was added to expensive beef products shows that a minimum quality level – which the general marketing standard guarantees for fruit and vegetables – is also required for the cheap price segment. Anything less would be cynical in view of consumers with modest financial means.

Trust grows on the basis of truth and clarity where purchasing food is concerned. Marking of fruit and vegetable origin plays a major role in that context. Recent reports in the media, on television or in the papers, keep repeating that imports from the Israeli settlements in the Occupied Palestinian Territories are prohibited. They are not. But they must be labelled correctly. Proper marking and labelling at the import level is implemented – pursuant to the marketing standards – by the BLE and by the inspection services of other member states. We grant that it can hardly be verified at downstream trade levels, but this is exactly why there is a differentiated inspection system. Consumers can hardly understand why dates are not labelled or rather why they are not checked for origin. Dates are not subject to the marketing standards.

Qualities and information of relevance to the consumer are your job, ladies and gentlemen. I can only appeal to you: „Keep your work and your interpretations at a level which assures that you, personally, would enjoy buying, eating or offering to your guests each product you consider conform.“

And on that note I shall hand the floor to Mr Döhler who, as the Head of the Division „Enforcement, Agricultural Law and Promotion“ at the Land Office of Environment, Agriculture and Geology in Saxony, is the director of a very committed and highly qualified group of inspectors who assure and uphold the quality level in Saxony. Mr Döhler, please be so kind as to open this conference.

I wish all of you three interesting and fruitful days.
Opening
Armin Döhler

Ladies and Gentlemen,

having arrived here from our beautiful capital of the federal free state of Saxony, I warmly welcome you to the International Meeting on Quality Control of Fruit and Vegetables, hosted by the Federal Office for Agriculture and Food.

It is, not least, to our geographical location that we owe our close economic ties with our neighbours, the federal states of Brandenburg, Saxony-Anhalt, Thuringia and Bavaria as well as the Czech Republic and Poland with whom we maintain extensive trade relations. Hence, it is a pleasure to see that so many of you, both from Germany and from abroad, have shown interest in participating in this Meeting.

At the International Green Week 2013, the world’s largest trade fair for the agriculture and food industries, we were able to witness quite an impressive variety of foods to savour.

„The World in a Shopping Basket“, „Our Food is Safe“, „Focus on Regional Specialties“ are some of the slogans we come across daily. Consumers expect food variety and quality on the one hand and food safety in connection with their endeavour to stay healthy, on the other. In that light, Maslow’s hierarchy of needs could also be applied to food safety, to which we contribute by guaranteeing that quality controls meet respective expectations.

I head the Section Enforcement Agricultural Legislation, Funding at the Federal Office of Environment, Agriculture and Geology of the federal state of Saxony, where Sub-division 35, Inspection Service Agriculture, is responsible for controls of marketing standards for fruit and vegetables. Our institution works under the Ministry of Environment and Agriculture of the federal state of Saxony.

Our organisational structure allows both a rapid flow of information among all parties involved and uniform administrative procedures.

Our inspections, rather than intending to foster mistrust, aim at building trust through qualified controls which, in the long run, will benefit all parties involved.

We are all aware that misjudgements or criminal actions of a few individuals are capable of ruining entire industrial sectors. It is our task to minimize the number of such events. Even though I am not in a position to claim that we are able to prevent them altogether.

Because the saying applies to all of us:

„To err is human, but to persist is diabolical!“

The interesting agenda of this Meeting should contribute to answering questions, to discuss problems, to exchange experiences.

Seen from a Saxonian point of view:

• in Regulation 1234/2007, the EU requires the control of marketing standards for fruit and vegetables at all trade levels.

• My colleagues control produce, starting at production level via the wholesale and up to the retail trade level.

The advantage:

Inspectors obtain first-hand information on the current problems a producer might be faced with, e.g. weather-related defects due to hail or excessive heat, or about defects caused at trade level, e.g. by insufficient care during handling. Partly, such issues can be solved by conciliation talks among contracting parties concerned.

In 2012, checks revealed complaints in 45 % of checks performed at the wholesale level, and even in 72 % of the controls at retail trade level. This shows that checks are very important at all trade levels.

We have intensified and improved our cooperation with food inspectors, with colleagues in municipal food market authorities and with the customs authorities of Saxony.

Matters relating to deficiencies in labelling or marking can be clarified directly with the producer.

Saxony’s inspection service does not merely point out deficiencies, it also offers advice at all trade levels in order to prevent deficiencies from
recurring. Our services also distribute written guidelines and instruction leaflets.

As producers have been using new ways and channels of marketing, such as vegetable box schemes and the internet trade, a harmonization of internet trade checks should be encouraged during this Meeting.

And the Meeting should also be used to provide insight into the production and marketing of soft fruits, pineapples, nectarines and peaches as well as cultivated mushrooms. As pineapples often arrive in Saxony with chilling injuries it is our inspection services’ request that, for a product as sensitive as the pineapple, the minimum temperature of 7 °C be maintained throughout the supply chain.

Dear ladies and gentlemen, from a nutritional point of view, due to their freshness and their variety, fruit and vegetables provide the best bases for healthy diets. Our activities are meant to contribute to these products meeting their consumers’ demands and expectations.

Thank you very much for your attention!
The research project „System to provide information on shelf-life and product quality of fruit and vegetables (at the example of kiwifruit) for consumers at the point of sale (POS)“ presented here is focused on the improvement of information for consumers on quality of fruit and vegetables. This project is a co-operation of a wholesaler, the Max Rubner-Institute, Department of Safety and Quality of Fruit and Vegetables, and the Weihenstephan-Triesdorf University of Applied Sciences, Faculty of Horticulture and Food Technology.

In the near future, consumers should be able to receive information on quality and general aspects via the mobile internet, i.e. smartphones before the purchase at retail. The model on information is developed for small lots or even single fruit on the example of kiwifruit. The aim of our studies will be to offer an approximate shelf-life date with these models under certain storage conditions for kiwifruit Actinidia deliciosa (A. Chev.) var. deliciosa (C. F. Liang, A. R. Ferguson) variety ‘Hayward’. Kiwifruit are ideal for this project as there is one main variety grown in all producing countries and available at the markets all year round.

Assessment of quality

The marketing standard for kiwifruit covers external quality parameters that are visually presented by the OECD explanatory brochure (edition 2008, http://www.oecd.org/agr/fv). Double fruit, very flat fruit or shrivelled fruit are accepted neither by the marketing standard nor by trade. Fruit showing glassiness are not accepted. However, it is not always easy to determine the degree of damage from the external appearance without any doubt. Glassiness is acceptable (see slide) at level 1 in Class II only while any more progressive degree of damage has to be excluded.

In addition, the standard defines internal characteristics such as sufficient ripeness determined by a minimum brix level of 6.2° or a minimum dry matter content of 15 % at harvest or a minimum brix level of 9.5° when entering the marketing chain. To assess the internal quality, the dry matter content (mainly starch) is essential as this dry matter was stored during the development of the fruit and may be transferred to sugar during the ripening process. The soluble solids (mainly sugar and some pectins) can be measured as degree brix. Another quality characteristic is the firmness of the fruit that can be measured by a penetrometer.

Kiwifruit and the ripening process

Kiwifruit are climactric fruit that may be harvested hard ripe and may continue their ripening process after harvest provided they have been harvested at the right time and stored correctly. They may experience a quicker ripening process when treated with ethylene (C₂H₄). Kiwifruit are produced in the Northern hemisphere. The most important supply countries are Italy and France with a harvesting period in November/December and a supply period until April/May. Kiwifruit from the Southern hemisphere are from New Zealand, Chile and Australia. They are harvested in March/April and marketed in Europe until November. The fruit may be stored at 0 to 1 °C for more than 6 months. Storage in controlled atmosphere is appropriate and applied during transportation by sea from the Southern hemisphere. Important to know, the ripening process continues even at very low storage temperatures, but at low speed and the firmness of the fruit decreases. The graphic shows that the firmness of kiwifruit decreases strongly during the first five weeks of storage.

The ripening of the fruit is very much dependent on the original condition of the fruit. To exercise a controlled ripening, the state of the fruit at the beginning must be known, i.e. firmness, brix level, time already spent in a cool storage. The temperature and concentration of ethylene is selected in accordance with the state of the fruit. These parameters determine whether the ripening process is slower or quicker. By the way, the concentration of ethylene is different for
each species – bananas and avocados tolerate relative high doses of ethylene (up to 900 ppm), while mangoes can be ripened without any additional ethylene. Kiwifruit are rather susceptible to ethylene. Not more than 0.03 ppm ethylene may initiate the ripening process, in general they easily tolerate 100-150 ppm.

The growing conditions such as irrigation, fertilisation and doses of growth hormones have a great influence on the ripening of fruit. Anyway, the most important parameter is the time of harvest. Kiwifruit being harvested two weeks later develop a higher brix level (7-9 or 10), have a greater firmness and have a better shelf life.

Non-destructive methods for the assessment of quality

An assessment of quality by means of non-destructive methods is possible. On the one hand, image-guided methods are applied to determine e.g. colouration and external defects. On the other hand, methods using the near infrared spectroscopy (NIR) reacting mainly on hydrogen compounds are applied. A NIR-spectrometer consists of halogen bulb, sensor to determine the reflected and transmitted radiation of a wave length between 303 and 1136 nm, a spectrometer for data collection that is connected to a PC via analog-digital converter and a software for data evaluation. The kiwifruit are lightened with halogen bulb and the light is reflected, absorbed and transmitted.

Chemometrics

Data revealed by NIR spectroscopy can only be assessed by chemometric methods. In that context, datasets obtained from NIR spectroscopy are correlated with test readings obtained by means of destructive, chemical and/or physical measurements. In this project the NIR test readings are correlated and calibrated with dry matter content, brix level and firmness of the fruit. To develop a correlation model, several hundreds of fruit of very different stages of ripeness are checked for their brix level, firmness and internal defects by using the NIR-method and correlating them with the result of the destructive measurements. The better the fruit represent the whole range of ripeness and degrees of internal defects the better the correlation model will be. Each of the NIR test results is correlated with its respective destructive test readings. These data are used to set up the appropriate equation. Once the calibration is done and the correlation model is developed any unknown fruit can be checked and assessed in accordance with the correlation model.

Application in a commercial quality assessment

A grading machine with NIR equipment may check 600 fruit per minute for their brix level, firmness and internal defects. For commercial purposes limits for the different quality characteristics (parameters) are defined; e.g. kiwifruit considered „ready to eat“ must have at least 11° brix. In addition, for firmness and internal defects limits are defined. Fruit that meet all three limits are „marketable“ and leave the grading machine via the respective channel. Fruit being too unripe and/or hard are returned back to the ripening chamber. Fruit that were not checked properly are returned and experience the grading process a second time.

Prediction of shelf-life

The development of the quality parameters were checked for unpacked fruit and fruit in modified atmosphere packaging (MAP) by simulating suitable storage conditions; i.e. in
the refrigerator (10 °C, 55 % relative humidity), at ambient temperature (20 °C, 55 % relative humidity) and ideal conditions in supply chain (0.5 °C, 95 % relative humidity). By means of these experiments, the optimal or maximum shelf-life of the fruit at these storage conditions was determined. The aim of these experiments was to develop recommendations on the best eating quality before dd.mm.yy. The consumers shall be informed accordingly to allow the consumption at optimum eating quality. In addition to these measurements, sensory tests evaluate, double check and support the results of the measurements.

**Consumer and information**

To understand the information on quality aspects of fruit and vegetables required and the information channels used by consumers, a comprehensive consumer survey was carried out in retail markets in southern Germany. Growers were asked about the growing conditions and the harvest time of kiwifruit. The answers and photos of kiwifruit on the vine, the orchards and information on maximum shelf-life were integrated in a database.

Consumers shall access this information from the database via QR code (quick response code) and smartphones. Today, consumers preferably get their information from the classic media as newspapers and leaflets. However, the survey revealed that already 31.8 % of consumers possess and use a smartphone. At the end of the project the distribution of smartphones might have increased and QR codes will certainly play a more important role in obtaining information. Consumers are mainly interested in pesticide residues. This information cannot be provided by NIR spectroscopy and must be excluded from this research project. At the end of the research project a second survey is planned to check whether consumers are able to use the QR-code and whether the information in the database meets consumers’ needs or must be amended.
Freshness Terminal – Decision-making aid at the POS
Martin Geyer

The freshness terminal (FT) shall provide information for the consumer on the „history“ of the produce, the actual state of the produce as well as on the optimal handling after purchase. The freshness terminal shall be the optimal link between consumer and the process from production to distribution. Thus, quality losses of fruit and vegetables and the waste shall be reduced. This project is developed under the title „Freshness terminal system for fruit and vegetables – a tool for consumers‘ decision“ under the BLE reference number: 511-06.01-28-1-67.010-10 by Manfred Linke, Guido Rux, and Martin Geyer at the Leibniz Institute for Agricultural Engineering Potsdam-Bornim.

Fruit and vegetables are very susceptible for quality losses. Decomposition of storage compounds start already shortly after harvest and continues until consumption. The chemical, enzymatic and microbiological processes being responsible for this decomposition have different dynamics with respect to the conditions of the process. Thus, components being important for human feeding such as vitamins, polyphenols, minerals and micronutrients disappear. This loss happens long before the external appearance (discolouration, decrease of firmness) affects the marketability or even decay can be assessed.

Losses of foodstuff

International studies assume, that apart from these externally not detectable losses of value adding components, up to one third of the produced fruit and vegetables deteriorate before reaching the consumer due to inadequate handling after harvest. Nearly half of food waste produced by consumers consists of fruit and vegetables – again mainly due to inadequate handling and storage.

Transparency creating confidence

Today, consumers can assess the actual state of the produce only by checking external characteristics such as colouration, texture consistency and eventually smell – which is a rough and – in dependence of the produce – insufficient assessment. However, it is important to know how far the produce is already progressed in the direction of decay. With this information only, the consumer may assess the real quality of the produce and take the decision on purchase based on the price-performance ratio. On the other hand, the trader could profit if they could provide information on quality and freshness of the produce to the consumers. Increasing transparency could strengthen the confidence between producer/retailer and consumer – a win-win-situation for both partners. The consumer – buying more and more conscious – would not only know what he/she was buying but also from whom.

Information flow

The project is dedicated to the development of an innovative information system providing the basis for all information relevant for the respective produce such as origin (producer, variety, production method, time of harvest etc.) and actual freshness. All information shall be accessible for consumers through a touch-sensitive operation terminal at the point of sale as well as through a mobile phone by means of QR or barcode or on the internet. The data on freshness are predicted on the basis of the recorded climate data. This means that at the point of sale not only historical data of the produce (origin) but also actual information, i.e. the real quality of the produce are available. The pre-condition for statements on the freshness are based on data on the climatic conditions that the produce experienced along the supply chain from producer to consumer. A data logger connected to the terminal is the last logger in the process chain and measures the climatic data during presentation at the point of sale. Already today, different control systems are available. Alternatively, a new data logger system developed by our institute and supported by the Federal Ministry for Education and Research is available.
Consumer’s expectation

A consumer survey in organic shops by Humboldt University, Berlin revealed that the majority (74 %) of consumers wishes more information. However, consumers are not able to clearly specify which type of information they are interested in. Some consumers (even in organic shops) buy by price and external appearance.

The question on the preferred medium did not provide the answers „at the produce/label“ or „paper“. Anyway, the consumers did add these options to the list from their own experience.

A survey along the value added chain in trade of organic produce, the interviewed persons expressed their concerns with respect to the allocation of information:

Producer: Additional input, operability, provision of information (how is information submitted / transported along the chain?), data input during harvest.

Wholesale: Regional trade and customer retention, transparency, conflict of interest, „best before date“, maintenance of the platform, control, exposing of weaknesses.

Retail: Input versus benefit, reliability of freshness terminal, products are mixed at the point of sale, training of staff members, data input.

Consumer: End to end transparency along the chain, improved communication, benefit and excess value through more product specific information (state of produce).

At the International Green Week 2013 in Berlin, 100 visitors of the Special Presentation of the Federal Ministry for Food, Agriculture and Consumer Protection answered the question „Which information is interesting when purchasing fruit and vegetables?“ They could nominate three out of eight categories and the top three were origin (producer) with 75 %, freshness (shelf-life) with 57 %, and method of production with 54 %.

Consumers would like to receive more information. They do not want to buy „camouflage packages“ such as unripe (never ripening to good quality) mangoes, potatoes with internal black spot, sour kiwifruit, tasteless strawberries or yellowing broccoli. The state of produce is essential, or as an anonymous said „Quality is if the consumer comes back and not the produce."

Freshness terminal

At the freshness terminal information shall be provided on the produce (type, origin, regional origin), on the state of produce, on the optimal handling, on additional information (e.g. recipes). This information shall be available via display at the point of sale or by mobile phone / smart phone by means of QR code.
Development of a shelf-life model

The most important element for the shelf-life is the thermal stress post-harvest as the main enzymatic degradation processes are strongly temperature dependent. Temperature and time are the parameters influencing significantly the degradation or transformation of components. This project should develop most precise models on the prediction of shelf-life allowing precise statements on the current state of the produce such as freshness, degree of degradation of components, or remaining shelf-life taking into account different storage temperatures.

Summary

- Consumers expect more information.
- Information on regional origin, method of production and freshness are estimated.
- New media could help to improve the communication between trader and consumer.
- The freshness terminal shall provide information on state and handling of produce.
- The collection of data is difficult and complex.
Consumer demand for berry fruits, especially for raspberries, increased strongly during the last years. Apart from the good image of berry fruits, the changes in marketing and production did contribute to this development. Berry fruit are traded all year round, mainly chilled. During the off-season, imports play an important role. The domestic season has been prolonged clearly. The quality of berry fruit available on the market is much better than some years ago.

Quality: Consumers and traders usually have different ideas about quality. For consumers the taste is most important, with the implicit understanding of other aspects like good appearance, protecting packaging and a time span of several days for consumption. For traders, the appearance and shelf-life are on first place, while the importance of taste is somewhat in the background. In production, the producer is working on a compromise between these demands while the profitability of production is at the very fore. To say it in short: Quality is the customer coming back and not the goods.

Raspberries

In Germany, raspberries are mainly produced in Baden-Wuerttemberg, followed by Lower-Saxony and – to a lesser extend – in Bavaria and in North Rhine-Westphalia.

Varieties: In floricance varieties, ‘Tulameen’ and ‘Glen Ample’ dominate the production. The share of ‘Glen Ample’ has slightly increased because of slightly higher yields and the harvest time being one week earlier.

In primocane varieties, ‘Polka’ and ‘Himbo-Top’ are still standard. ‘Polka’ is in fact a little too dark, but early and with very good taste. ‘Himbo-Top’ is a little too soft. Newer varieties such as ‘Sugana’ or ‘Rubyfall’ are introduced in practical production. At import, the dominating variety is ‘Maravilla’ from Driscoll’s but unfortunately not freely available. New varieties such as ‘Kwanza’ should be the competitor for this variety in future.

Raspberries – Floricanes

<table>
<thead>
<tr>
<th>Variety</th>
<th>Origin</th>
<th>Yield</th>
<th>Harvest Time</th>
<th>Fruit Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glen Ample</td>
<td>Glen Prosen x Meeker, Scotland</td>
<td>High yield</td>
<td>Early</td>
<td>High yield; Medium harvest time; elongated, conical, large fruited, medium-red, robust, medium/easy to pick and very beautiful fruit; very good taste; canes with prickles.</td>
</tr>
<tr>
<td>Malahat</td>
<td>Meeker x Selection, Canada 1985</td>
<td>Medium yield</td>
<td>Early</td>
<td>Medium yield; Early (about 7-10 days before Tulameen); elongated, conical, medium to large fruited and robust (but somewhat softer than Tulameen) fruit; canes with few prickles.</td>
</tr>
<tr>
<td>Tula Magic</td>
<td>Fruatfri (Autumn Bliss x Tulameen, Switzerland)</td>
<td>High yield</td>
<td>Early</td>
<td>High yield; Early (about 7-10 days before Tulameen); Heart-shaped, medium to dark-red, medium firmness (too soft for retail) and medium to pick fruit; good taste; canes with many and strong prickles.</td>
</tr>
</tbody>
</table>

Raspberries – Primocanes

<table>
<thead>
<tr>
<th>Variety</th>
<th>Origin</th>
<th>Yield</th>
<th>Harvest Time</th>
<th>Fruit Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polka</td>
<td>Autumn Bliss x Rubus crataegifolius, Poland</td>
<td>Medium yield</td>
<td>Early</td>
<td>Medium yield; Early variety; elongated conical, medium to large fruited, dark-red and robust fruit (partly difficult to detach from the cone); canes with prickles.</td>
</tr>
<tr>
<td>Himbo Top</td>
<td>Rafzaqu (Autumn Bliss x Himboqueen, Hauenstein, Switzerland 1990)</td>
<td>Medium yield</td>
<td>Early</td>
<td>Medium yield; Early variety; Conical, medium to large fruited, dark-red and robust fruit (partly difficult to detach from the cone); canes with prickles.</td>
</tr>
</tbody>
</table>
high yield; medium to late variety (one week after Polka); conical heart-shaped, medium to light-red, medium firm and easy to pick fruit; medium taste; canes slightly prickled.

Traditional method of production (perennial cultivation in soil): Floricanes: good structured soil, free of waterlogging, ridge planting, intermixing of organic material; spacing between rows 2.50 m to 3.00 m and 40 cm in the rows; on wire trellis (4 wires, 1.80 to 2.00 m height, support frame for lateral shoots); 8-10 canes/m; fertilizer (about 80 kg N in two applications mid March to mid April or fertigation 6 kg N per week), plant protection (botrytis, aphids, spider mites), irrigation (double house 25 cm from the row), sheltered from the wind, management of the canes (first shoots are eliminated with a herbicide shortly after flowering; after harvest the old canes are eliminated without any delay and only 6-10 young shoots are left, after harvest the young canes are attached to the support frame, end of winter the canes are cut to the final height), rain guard (from May to end of harvest as single row cover or tunnel) yield about 6-10 t/ha (8-14 t with rain guard; Tulameen 15/20 June to 20 July); partly production on ridges.

Forced production: Annual production in containers with substrate; occasionally perennial production in the soil; either floricane varieties or floricane cropping of primocane varieties; closed and unheated greenhouses (polytunnels); harvest begins 20 May, yield: 12-18 t/ha.

Scheduled production: In the 1st year the young canes of floricane varieties are grown with 2 canes in a 2 litre container, canes are 1.80 m high, from December canes are stored at -1.5 °C, in the 2nd year the refrigerated canes are taken to the field – depending on the scheduled harvest from 15 April to 1 June, canes are planted in 7.5 litre containers with substrate, 3 containers with 2 canes each per metre, all young shoots are eliminated, the containers are covered with a tunnel (as rain guard in summer or in order to force the production with closed tunnels), picking is from beginning July (about 60-80 days after planting) to beginning October, yield 14-20 t/ha, excellent quality even after the peak season, high picking rate, long on the market.

Primocanes are produced the same way, but the canes are partly supported by cords or wire mesh, thinning out of the canes mid May, all canes are eliminated after harvest, picking from beginning August to frost, covering the rows is very important, picking in spring or early summer especially in Himbo-Top (harvest from beginning June, the old canes are eliminated directly after harvest and this year’s young canes produce fruit for harvest in autumn).

Annual production: In the first year the raspberries are grown in the soil, in a little ridge;
Extended production: Primocanes; in closed tunnels; harvest until mid November, yield 8-10 t/ha.

The new methods of production are clearly on the rise. The production volume out of these methods might be about 30 % of the total volume. The traditional methods of production are decreasing because of substantial problems with the physical health of the canes.

Blackberries

In Germany, blackberries are mainly produced in Baden-Württemberg.

Varieties: The standard variety is 'Loch Ness'; in addition, 'Loch Tay' is grown as early variety and 'Chester' as late variety.

Loch Ness (Scotland): erect growth, thornless, medium to early variety, high yield, large fruited, ripe berries of excellent taste, susceptible against winter frost.

Loch Tay (Scotland): new variety, erect growth, thornless, early variety (10-14 days before Loch Ness), medium yield, medium fruit size, good taste.

Chester Thornless (USA): erect growth, thornless, medium to late variety (2 weeks after Loch Ness), good yield, maturity not guaranteed in autumn, medium taste, less susceptible against winter frost than Loch Ness.

Method of production: Perennial production in the soil (good structure, no waterlogging, ridge planting, intermixing of organic material); on wire trellis (4 wires, 1.80 to 2.00 m height, support frame for lateral shoots); spacing between rows 2.50 m to 3.00 m and 100 cm in the rows; irrigation (double house 25 cm from the row); fertilizer (about 100 kg N in two applications mid March to mid April or fertigation 6 kg N per week); plant protection (downy mildew, red berry mites *(Acalitus essigii)*, botrytis, aphids), sheltered from the wind, management of the canes (first shoots are eliminated with a herbicide shortly mid April; if canes are missing the young canes can be cut down to 60 cm height; early lateral shoots are cut down to 25 cm; after harvest the old canes are eliminated without any delay and only 4-5 young shoots per meter are left (the strongest and the weakest canes are eliminated), end of winter the canes are cut to 10 cm above the highest wire; lateral canes are cut to 3-5 cm), rain guard (from May to end of harvest); occasionally starting earlier in spring using closed greenhouses (polytunnels); bumble bees and honey bees to guarantee good pollination (1 hive/1,000 m²); first attempts with cooled canes; protected production on 10-20 % of the area; harvest 10 July to October (rain guard) or 20 June to mid September (forced production); yield 10-25 t/ha.

Problems: Frost in winter time and red berry mites *(Acalitus essigii)*. Marketing: mainly picked unripe due to traders’ demands.

Red Currants

In Germany, red currants are mainly produced in Baden-Württemberg.

Jonkheer van Tets: Very early variety (mid to end June); medium yield; berries with tendency to “run-off”.

Rotet: medium-early variety (end June to beginning July); robust, high yield, long bunches.

Rovada: Late variety (mid to end July); high yield; very long bunches; slightly susceptible to cracking.

Method of production: Open field production in the soil (good soil structure, no waterlogging, eventually ridge planting, intermixing organic material); spacing between the rows 2.50 m to 3.00 m and 40-50 cm in the row in case of 1 shoot per plant (50-60 cm in 2 shoots, 60-80 cm in 3 shoots), 2- or 3-branch-hedgrowing-system with wire-frame; fertilizer (about 80-120 kg N in two applications from mid March or fertigation 6 kg N per week), irrigation (double house 25 cm from the row); plant protection (aphids, powdery mildew, spider mites, Colletotrichum, botrytis), sheltered from the wind; occasionally single-row-cover; pruning (in winter: sharp cut to the annual lateral shoots with 20-40 cm long; or cut to 2-4 cm; not more than 6-10 annual lateral shoots per branch; in summer: when berries are colour turning the steep-standing branches and too long shoots are cut to 2-4 cm and to support a uniform ripening process this year’s shoots are cut to 15-20 cm from the last bunch); storage of red currants until November, yield 8-14 t/ha

Problems: Berries “run-off” in ‘Jonkheer van Tets’; meeting the higher specifications of retail trade with respect to maximum levels of pest residues.
Quality Production in Blueberries
Felix Koschnick

The blueberry, a perennial shrub of the Ericacea family, grows wherever the bell heather grows: in sour soils which are not too rich but hold high amounts of organic substance. Commercially, however, rather than *Vaccinium myrtillus*, the wild European bilberry with bushes about 30 cm high, small, dark blue, slightly sour berries with blue, staining juice, *Vaccinium corymbosum, V. australe* and *V. angustifolium* are grown: Southern or Northern Highbush varieties, clearly higher and with bigger, sweeter berries, their flesh or juice being light-coloured and non-staining. Growers in Germany do not favour the term ‘cultured blueberries’. Apples are not called ‘cultured apples’ either, they argue and prefer to call the blue, commercially grown fruit ‘blueberry’.

As a crop plant, the blueberry is rather young. One of the earliest plantations mentioned in a written document, was established in Michigan around 1850. In 1906, the US Ministry of Agriculture began doing research on blueberries. Dr. Frederic Coville, the father of the blueberry, established the first breeding programme. By 1953, 30 varieties were already available for production. In Germany, Dr. Hermann was the pioneer of commercial blueberry production.

Cultivation

Ridge planting is the method used in a modern blueberry orchard. Ridges are 50 cm high and 120 cm wide at the bottom, narrowing to 80 cm at the top and a double-hose system is used for irrigation and fertilization. If necessary, the ridge may include some peat around the roots. In susceptible areas, irrigation is necessary for frost protection.

Occasionally (e.g. in Portugal or southern Germany), berries are cultivated in pots, with substrate, so-called „imitated“ locations which can also be reproduced in the field: Planting channels are filled with a mixture of substrate, peat and fertilizer which shall be heaped up to form a ridge.

In previous years, production in tunnels was used to advance harvest. Nowadays, this is no longer necessary due to supplies from southern countries. Today however, tunnels are still interesting as they allow picking and meeting delivery dates even under less favourable weather conditions.

Blueberries are perennials with a production life of up to 25 years – in Germany.

Volume of production and trade

From 1970 until today, the global development
of area under crops shows how successful blueberries have been and will continue to be at a prognosis of 130,000 ha or 630,000 t for 2015.

In 2013, an acreage of 7,600 ha is expected for Europe, with Poland (2,500 ha), Germany (2,300 ha) and Spain (1,500 ha) being the major producing countries. This acreage is expected to yield 186,980 t with 20,000 t from Spain, 15,000 t from Poland and 9,000 t from Germany. However, any frost or cold weather, in Poland and Germany in particular, may quickly reduce these yields by half. In Poland, large parts of young orchards were destroyed by frost during the past three years.

In Europe, the United Kingdom and Germany are the largest consumers with the UK mainly importing (especially from Spain, Poland, and the Netherlands) and Germany mainly consuming its domestic production.

Production in Germany

Producer structure is mainly small-scale with an average of 5 to 15 ha per farm. Only about 15 farms cultivate on more than 35 ha of acreage. In total, the acreage under cultivation has increased – from about 1,900 ha in 2009 to 2,300 ha in 2012. 95 % of the area are natural blueberry locations, i.e. berries are produced on natural soil, while the remaining 5 % are substrate locations. In general, natural locations are preferable because plants are healthier, longer bearing and with better fruit quality. In future, however, these natural locations are quite endangered by the EU ban on the ploughing up of grassland. Consequently, costs for primary producers will increase.

The primary producer achieves an average market price of about 3.34 €/kg. Annual production costs amount to 3.55 €/kg, comprising 1.10 € for harvest, 0.20 € for conditioning, 0.50 € for packaging, 0.75 € for transportation and 1.00 € for maintenance.

What causes this situation? In a small-scale structure, production costs are often unknown. Farm equipment is not adapted to increased acreage. Farmers tend to cling to traditional ways (“We always did things this way.”). Knowledge of the markets is lacking, as are confidence and – contrary to the Netherlands – co-operation. Dutch horticulturalists employ specialists in plant and fruit production. They jointly use packing stations and co-operate in the field of marketing to reduce costs.

In Germany, the beginning of the so-called Blueberry Weeks around July 14 entails a sudden price decrease. As small-scale farmers do not know the market, trade can easily put them under pressure. This explains the drastic price reductions when harvest begins, even though, at the beginning of the season, consumer demand cannot be satisfied. In France, by the way, there is a minimum wage of 9.43 €/h; wages based on the amount of berries picked are not allowed. Thus, costs for harvesting are 100 % higher than in Germany.

In general, good orchards are profitable for 10 to 18 years in Germany which is another explanation for the slow market adaptation measures.

Quality

Fruit quality is influenced by different factors.

Climate conditions throughout the year: Wet years lead to Botrytis and Anthracnose, cold years entail damaged berries and losses, while drought (without irrigation) yields small berry
sized.

Residues: On the one hand, the number of active components is of importance as most of the trade specifications accept a maximum of 5 active components only. On the other hand, resistance development is to be avoided which is difficult with a limited number of 5 active components. Traders who, for reasons of prevention, do not stick to an active component restriction support good production practice. Follow-up treatments with another active component may cause the accepted number of active components to be exceeded.

Vitality of orchards: Depending on the year, varying vitalities may yield varying qualities.

Producers: A number of factors are decisive. Working according to schedule, for instance, which is often difficult to realize in small-scale structures. A lack of pruning leads to a lack of both light and air among the bushes which entail too many, too small berries. Best qualities are produced on 3- to 4-year-old shoots.

In Germany, the fact that too many unproductive old varieties are still in production affects yield and quality. Also, too many different varieties are grown. Contrary to Spain and the Netherlands, new varieties are hardly considered. Admittedly, trade – leading wholesalers in particular – do not show enough interest in servicing producers adequately.

Product specification: Producers often do not know what clients (both traders and consumers) expect of a product. Product specifications are missing. Those given by German traders mainly concern active components, levels reached in terms of AFD limits, legally acceptable residue maxima, packaging and labelling while product quality remains unconsidered. Traders in the UK include product specifications regarding picking, colouring/maturity, size, fruit quality, cool storage, pesticide input and packaging. These provisions are illustrated by photos.

Producers and traders must be trained where handling of the fruits is concerned (storage, temperature, presentation, shelf life). Mistakes often occur during transport: Shipping blueberries together with ethylene producers, e.g. apples, accelerates the ripening process of blueberries. The cool-chain must be respected as complaints can be lodged within 7 days! Poor product maintenance at the point of sale must improve; in the UK, berries are always presented chilled.

Changes happen but awareness regarding quality grows only slowly. Years ago, trade just asked for „blueberries”, today they order by variety. It makes a big difference whether producers pick just „blueberries” or harvest by variety. Picking blueberries in time and on a daily basis requires both adequate planning and well-trained pickers. These aspects are being worked on in Germany.

Certification: Producers are faced with a jungle of certification systems and/or labels (BIO, HACCP, QS, Tesco Nuture, M & S Field to Fork, Global GAP, SEDEX, Albert Heijn, ISO, LEAF, IFS FOOD). Each certification requires data management and the operation of a system-related database. It entails investments in terms of COSTS and time. How shall the common producer make heads or tails of all that?

There are both product- and process-oriented certification systems such as Global GAP. ISO, including HACCP, can be adapted to the individual process. Unfortunately, it is not accepted by all clients. Whether produce is ethically harmless can be proven via the BSCI code of ethics or GRASP.

Product security: Consistent traceability is essential. From the producer’s point of view, German QS-systems are considered very efficient because the entire system (producer, laboratory, trade ...) is controlled while the database remains the only problem.

Organic production: We do have a German Bio label as well as specific production associations. The problem lies in the fact that organic associations focus on regional marketing and are unable to market the available volume of organic blueberries. Hence, the lion’s share of organic blueberries is sold on the conventional market. In addition, the price difference between organic and conventional produce decreases continuously. Organic producers often decide
to sell their produce as conventional produce if prices are the same in order to avoid additional pressure on the price for organic produce. Production costs for organic produce exceed the price for conventional produce by about 1,00 €.

**Harvest and conditioning**

Manual or machine picking: Manual picking is optimal for berry fruit destined for the fresh market. Only handpicked berries have experienced careful handling and guarantee a long shelf life. Machine picking is possible in case of new, hard-fleshed berries and in rapidly selling markets. Nevertheless, the first and second harvests should indeed be done manually. Northern Highbush varieties require up to 7 successive pickings as they ripen successively. Southern Highbush varieties, being exclusively grown south of Bordeaux, even require 15-17 pickings per bush.

**Conditioning/Presentation:** Grading machines, which include colour and firmness grading, improve the quality of the produce. At 100,000 €, a sorting and grading system which will be used during a maximum of 8 weeks per year is extremely expensive for a small-scale farmer with 10-15 ha of acreage. Co-operation would be the solution.

Tendency towards co-operation: Some German producers already use packing stations in the Netherlands. They are much more profitable because they are used all year round – also for conditioning of overseas produce during the winter. Year-round usage is extremely favourable also with respect to the supply and disposition of trained staff.

Storage is problematic only because of a lack of knowledge. Everyone knows how optimal storage works. The common German farmer stores produce that he/she could not sell. But in principle, only the best quality of a day should go into storage because it stays the freshest and shall reach the customer in good quality even after storage.

How to improve the situation? Only better training of producers (and traders) with clear prerequisites given, an improved co-operation among producers and producers seeking consultancy can solve the problems mentioned.

Varieties: When varieties are selected, individual producer requirements must be taken into account: location, soil, client, harvesting period, etc.. A late variety such as ‘Aurora’ can be grown and harvested in the Southern Heath while it will not ripen in the Northern areas.

Tesco, Marks & Spencer, Waitrose, Sainsbury’s, Albert Heijn buy by variety. German trade does not buy by variety yet but there is a tendency towards old varieties becoming less popular. ‘Herma’, for example, is a less popular variety due to its bloom which gives berries their speckled appearance.

In general, the market demands big, firm, nice-looking (light blue with bloom) and tenderly crisp berries. They must have a good shelf life or, as people in Chile say: They should have long legs in order to walk for a long time. They should also be tasty. The demand for supplies by variety is increasing. Production and marketing of new varieties should also respect license rights. To avoid royalty payments, varieties are frequently offered under false denominations in Europe.

The „new“ varieties do meet the above-mentioned criteria. Southern Highbush/Rabbiteye varieties have dry, firm flesh and a relatively low juice content. Thus, they are clearly more robust. Northern Highbush varieties have softer flesh and are juicy. Southern Highbush varieties are on the market until June, then, Northern Highbush varieties take over.

Data source: OVR Jork [Fruit Advisory Service of the Altes Land, Jork], Bund Deutscher Heidelbeeranbauer e.V. [Association of the German blueberry growers] and the author.

Many thanks to Alfred Peter Entrop, consultant for berry fruit of the OVR Jork and Heiner Husmann, chairperson of the Bund Deutscher Heidelbeeranbauer e.V.
In fact the name CRANBERRY has been rumored to have been created as a result of the resemblance of the cranberry blossom to the American sandhill crane, a bird that has historically been associated with cranberry growing areas in the United States.

The American Cranberry (Vaccinium macrocarpon), is in fact one of only 3 commercially grown fruits that are native to North America. The other two are the American blueberry (Vaccinium corymbosum) and the Concord grape (Vitis labrusca).

It is important to also recognize what U. S. cranberries are NOT. Here are 4 of the more common closely related berry fruits that are often misidentified or mistaken to be the American Cranberry:

- Lingonberry or cowberry (V. vitis-idaea) – often found in jams, jellies or juices;
- European blueberry (V. myrtillus) and
- European or bog cranberry (V. oxycoccos) – an obviously very close relative to the American cranberry that is often easily mistaken.

To be certain – most all cranberries grown and produced in the United States are the American cranberry species. The American cranberry is the more robust of the species which contributes to good growth, consistent production and supplies.

The American Cranberry has a long history in the United States. It was certainly recognized by Native Americans. I’m going to trace historical aspects of U.S. cranberries from the time the first foreign settlers – the Pilgrims – came to North America in 1621 to the 1900’s focusing on this nearly 300 year span as it represents the period when most of the industry development and innovation occurred. I’ve mentioned Pilgrims – and although I recognize that Thanksgiving is an American celebration – it is important for its first introduction of the American cranberry to the North American settlers.

The American cranberry is a fruit with exceptional characteristics and a wide variety of uses:

- As a food product: Although they didn’t know why, Native Americans were familiar with the nutritional benefits of eating American cranberries
- As a preservative for meat and was used in a product called ‘PEMMICAN’ that blended cranberries with meat and allowed preservation of the food for many months.
- As a poultice for healing wounds.
- As a dye for fabrics due to their brilliant red color used by native Americans

Early 1800’s saw the first commercial production. Growing areas occurred in former sites where from mid 1700s to 1800s bog iron was excavated and then smelted in blast furnaces. After the U.S. civil war in the late 1860’s the cranberry
industry saw significant growth and business development as a result of soldiers returning home from the war. In fact, some compared the interest and growth in the industry to the rapid growth of California, in the western U.S., due to the discovery of gold. Also, during the mid to late 1800's, the health benefits and storage capacity of the American cranberry were recognized by the growing U.S. whaling industry. Cranberries, even in raw unprocessed form, could be held for long sea voyages and, as a result of their high vitamin C, they were valued for protection against scurvy, a disease that results from Vitamin C deficiency. In those days, the cranberries were shipped in wooden barrels – one hundred pounds of cranberries fit in a wooden barrel. Today, the farmers measure their production in barrels or barrels/acre. For a 100 year period, the cranberry industry experienced great innovation. Formal academic institutions and programs emerged to improve yields, fruit quality, and environmental stewardship. Programs provided important guidance to growers for the improvement of production methods and collection of data that could be used to promote continued industry growth. The University of Massachusetts actually issues a quality forecast for the growers. The growers during the growing season can adapt their production practices. The growers believe quality begins in the field and they use applied science.

Also during this century of innovation, grower associations across the U.S. emerged. The Cape Cod Cranberries Growers’ Association was formed 125 years ago. Peer to peer education, formal recognition, and sharing of industry wide problems that allowed greater and more targeted problem solving response. Standardized measures, like the 100 lb (37.3 kg) barrel that is still used today, were codified. These standardized measures enhanced business normalcy and increased sales through the development of industry wide adoption of standards.

The emergence of mechanical inventions – all aspects of cranberry production including sorting machinery, increased production efficiencies and allowed dramatic scaling up of cranberry businesses. The introduction of mechanical pickers replaced the old method of picking by hand and with wooden scoops which today are used as collector’s items. They used separation machinery such as wooden bounce boards given a cranberry seven chances to:

- bounce over wooden boards to get down into the sorting line. A good cranberry will bounce and a bad cranberry will not.

1860-1960: 
A century of innovation…

- Formal academic research programs initiated

- Mechanical inventions increase industry efficiency

And as a result, the first million barrel crop for the U.S. was achieved in 1953. The industry has continued to grow since that time.

Ups and downs but the trend has been one of growth at an average of 4.13% over the last 50 years. Approximately 1,200 cranberry growers cultivate 38,500 acres or 15,500 ha. Approximately 55 cranberry handlers receive the cranberries, process the cranberries into a final product or market them as fresh fruit. Many handlers are also growers.

The State of Wisconsin is the number 1 producer of cranberries followed by Massachusetts (2), New Jersey (3), Oregon (4) and Washington State (5). Wisconsin makes up about 57% and Massachusetts up about 30% of the total US cranberry crop. Total estimated U.S. production for the last growing season was close to 8 million barrels (15.5 million kg). Wisconsin leads U.S. production at about 8.8 million kg, Massachusetts around 4.4 million kg, New Jersey about 1.2 million kg, Oregon 660 thousand kg, and Washington 200 thousand kg. Production...
changed dramatically. In 2000, the production took off in Wisconsin, today they produce 2 barrels for every one barrel that is produced in Massachusetts. The large reason for that is because Wisconsin is an agricultural state, whereas Massachusetts is very urbanized and the acreage is relatively stable.

Cranberries grow in bogs or marshes that are dry most of the year. The bog sizes range from 10 to 1,000 acres or 4 to 400 ha. The photo shows cranberry beds from Wisconsin, very rectangular and made out of virgin land. In Massachusetts the bogs follow the contours of the land – the bogs have as much character as the farmers.

The soil is a mixed soil with lots of organic matter which holds the moisture and it also has sand. The cranberry plant is relatively small. It grows horizontally along the soil and sends the vines (about 6 inches long) upright. The vines actually look like a carpet across the entire bed.

The cranberry vine itself will last over 100 years. The only reason to replant the vines is: 1) to improve production and 2) to get rid of a serious infestation (disease or insects). Re-planting requires about 4 years before the bog comes into full production.

In winter, the vines are in dormancy. They need this dormancy in order to an essence rest for the next year. The plant will come out of dormancy in April and the very tip of the vine begins to grow. The bloom starts to come out in July. European honey bees and bumble bees are brought to the bog for pollination. In July/August the berries start to set. The harvest is in September/October. After harvest the vine goes into dormancy to start the whole cycle all over again.

In winter time, the bogs are flooded. The bogs are enclosed by a series of dikes. The root system of the cranberries is very shallow; it’s only about 6 inches deep. Because the cranberries maintain their leaves all year round, the bogs must be flooded to protect the vines otherwise if the soil were to freeze, the winds would desiccate the
vines and kill them off. So by flooding, we help protect them from the winter temperatures. We also use this as an opportunity to drive buggies out on to the flooded bog and spread about half an inch of sand. Sand is an important cultural practice. It is used in order to manage some insect, weed and disease problems. In spring, when the ice melts that sand will sift into the vines and will bury some of the old runners and some of the insect eggs etc. This is done every 3 to 5 years if the weather permits.

**U.S. Cranberry Production**

*Winter “ice”*

The growing season begins in April. All bogs have underground irrigation systems. Sprinkler heads are used to protect the buds and the fruit from frost. Because the cranberry bog is the lowest area in the surrounding landscape it is the area where the cold temperatures can settle. The temperatures of the bog can be 10 to 20 degrees colder than the surrounding uplands. In clear cold nights in spring it is necessary to run the sprinkler systems to protect the buds and vines.

The farmers believe strongly in integrated pest management and are constantly monitoring what is happening on the bogs in order to assure that we are maintaining the quality of our product and yields. The automatic irrigation systems are run by the farmer's smart phone (starting the irrigation pumps, monitoring the soil moisture and temperature conditions). This is how to reduce the water use by 20 to 40 %.

There are two ways to harvest cranberries; wet harvesting and dry harvesting. Dry harvesting is when the bog stays completely dry. The harvesting machines are a little bit larger than 1 m in size. With its teeth the machines rig/rag through the vines stripping the berries from the vine and loading them into bags. These bags are then loaded into large plastic bins and air lifted of the bog by helicopters. The reason for this method is that heavy machines would destroy the vines and would sink into the bogs.

**U.S. Cranberry Production**

*Dry Harvest for Fresh Fruit*

Dry harvested fruit is sold as fresh cranberries. Only about 10 % of the US crop is sold as fresh fruit. Fresh fruit is sold typically in a very limited time season from harvest in October through the end of December.

Fresh or frozen cranberries are the product prepared from the sound, mature berries. For this product, the handlers require the farmers to wait until the fruit reaches a certain anthocyanin content and a brix content before they can harvest. The product is prepared by extra sorting. Optical sorters are used to sort out the off-colour fruit and the blemished fruit. These optical sorters replace the bounce boards that were mentioned earlier. The optical sorters are more efficient and remove the human touch from the lines. The following specifications are applied.

- Flavor and odor must be typical, i.e. they must be free from objectionable flavors and odors of any kind.
- Colour must be typical cranberry red; bright distribution of varying degrees of red, pink and uncoloured berries with a minimum of 90 % of the berry surface uniformly and characteristically red/pink and a maximum of 4 % white, yellow, and green berries.
- Colour (total Anthocyanin): minimum of 30 mg / 100 g fruit.
- Size: 95 % within 13/32” to 20/32” diameter.
- Defects: Equivalent to U.S.D.A. grade A. The fruit should be practically free of harmless
extraneous plant matter, stems, minor and major blemishes, foreign matter, rot, visible mould, insects, insect fragments, worms and worm holds; maximum 3% minor blemishes; maximum 3% major defects.

- Surface water: 1.6% ± 0.5% water which may adhere to the surface of the fruit (measurable on frozen fruit only).

- Freezer shrink: 2.5% ± 1.0% based on fresh fruit weight, frozen berries may lose moisture upon storage.

The preparation in accordance with this specification is to assure a wholesome product that is stored at temperatures necessary for preservation.

Fresh packaging: Enclosed in 12 oz. (340 g) poly bags, 24 bags per case. Case weight 18 lbs (6.7 kg) net, 21 lbs (7.8 kg) gross and 80 cases per pallet. Usually the recipe on the back of the bag requires more than 12 oz. of cranberries, so the consumer is forced to buy two bags – a conspiracy of the marketers.

Fresh shipping and storage: at 40°F to 50°F (5 to 10 °C) – with an expected shelf life of one month.

Frozen packaging: Enclosed in a non-sealed 2-mil blue colored high-density polybag inside a corrugated box.

- Frozen Superior Cranberries: 91950 – Net weight 40 lbs (18.1 kg).
- Frozen Superior Cranberries: 91951 – Net weight 10 lbs (4.5 kg).
- Frozen Superior Cranberries: 92015 – Net weight approx. 1200 lbs (544.3 kg).

Frozen shipping and storage: at 0°F to 15°F (-18 to -9 °C) with an expected shelf life of 24 months.

Wet harvesting: The bog is flooded with about 8 inches of water, just to put enough water over the vines. The harvesting machine is called a water-wheel which has a wheel that spins in front of it. It just spins slow enough and gentle enough to knock the berries of the vine. Once the berries are knocked of the vine they flow onto the surface. The reason why is the 4 small air pockets in each cranberry. The hollowness of the berry allows it to bounce and to float. Once the berries are knocked of the vines, more water is put on top of the bogs and flood them off. This creates a beautiful sight. We float all the berries to the surface a collect them with a boom and then pump the berries off of the bog.

Sweet and dried cranberries are today growing and becoming the number one product of the industry. This is mainly because of its versatility: 1) it lasts a long time in storage and 2) it can be used in baked goods, in salads, eating fresh out of hand. Sweet and dried cranberries are well accepted by consumers. Sweetened dried cranberries are produced basically by infusing sucrose syrup into sliced superior grade cranberries until a specific equilibrate Brix range is reached. The product is then dried to moisture
specification and lightly sprayed with oil in order to preserve the moisture. Some companies are actually taking the seeds of cranberries and pressing the seed oil. This seed oil is put on top of the dried cranberries increasing its matter-free content.

Specifications for sweet dried cranberries:

- Moisture: 13 to 18 %.
- Size: retained on 5/8” (16 mm) mesh screen (max. 5 % tolerance); through US # 4 screen (max. 1 % tolerance).
- Oil: 1 % maximum.
- Colour: typical uniform cranberry red.
- Flavour and odour: typical tart, fruit flavour.
- Foreign material (non-cranberry plant origin): none.
- Insect contamination: none.
- Harmless extraneous plant material (stems, leaves): 2 maximum / 25 lbs (11.34 kg).

Because of the health benefits the cranberries are becoming popular and global. We are starting to export a lot more. 1995 less than 10% of the total US cranberry crop was exported; today it’s over 30 %. As a result, the farmers are to grow to European Union standards. Today, all Massachusetts cranberry growers that sell to exporters exporting to the EU cannot use compounds that are not registered for use in the European Union. All fresh produce growers are using GLOBALGAP as their certification program and are working now on GAP standards for the processed side of the business.

**A final word… Exports as % of Production**
UNECE-Norm für Beerenfrüchte FFV-57
Reinhild Fänger
UNECE-Standard for Berry Fruits
Reinhild Fänger

Begriffsbestimmung                  Definition of Produce

Himbeeren – Raspberries
( *Rubus idaeus* L.)

Schwarze Johannisbeeren – Black Currants
( *Ribes nigrum* L.)

Begriffsbestimmung                  Definition of Produce

Brombeeren – Blackberries
( *Rubus sect. Rubus*)

Stachelbeeren – Gooseberries
( *Ribes uva-crispa* L.)
Heidelbeeren – Bilberries
(Vaccinium myrtillus L.)

Cranberries – Cranberries
(Vaccinium macrocarpon Aiton)

Kulturheidelbeeren – Blueberries
(Vaccinium corymbosum L.)

Kreuzungen dieser Arten
Taybeeren
(Tayberries
(Rubus sect. Rubus x Rubus idaeus L.)

Preiselbeeren – Cowberries
(Vaccinium vitis-idaea L.)

Kreuzungen dieser Arten
Jostabeeren
(Jostaberrries
(Ribes nigrum L. x Ribes uva-crispa L.)
Mindesteigenschaft  | Minimum requirement  
---|---
Nicht ganz  | Not intact

Mindesteigenschaft  | Minimum requirement  
---|---
Nicht gesund  | Not sound

Mindesteigenschaft  | Minimum requirement  
---|---
Nicht gesund  | Not sound

Mindesteigenschaft  | Minimum requirement  
---|---
Nicht sauber, nicht frei von sichtbaren Fremdstoffen  | Not clean, not free of any visible foreign matter

Mindesteigenschaft  | Minimum requirement  
---|---
Nicht gesund  | Not sound

Mindesteigenschaft  | Minimum requirement  
---|---
Nicht frei von Schäden durch Schädlinge  | Not free from damage caused by pests
Mindesteigenschaft | Minimum requirement
--- | ---
Nicht frei von Schäden durch Schädlinge / Brombeergallmilbe | Not free from damage caused by pests / Brombeergallmilbe

Mindesteigenschaft | Minimum requirement
--- | ---
nicht von frischem Aussehen | not fresh in appearance

Mindesteigenschaft | Minimum requirement
--- | ---
nicht von frischem Aussehen | not fresh in appearance

Reifeanforderungen | Maturity requirements
--- | ---
Beerenfrüchte müssen entsprechend ihrer Art genügend entwickelt sein und einen ausreichenden Reifegrad aufweisen | Berries must be sufficiently developed and display satisfactory ripeness according to the species

Reifeanforderungen | Maturity requirements
--- | ---
Kein ausreichender Entwicklungs- und Reifegrad | Berries do not display satisfactory ripeness
Klasse Extra  

Kulturheidelbeeren praktisch mit Duftfilm bedeckt
Blueberries practically covered with bloom

Klasse Extra  

Bei schwarzen Johannisbeeren sind nicht vollständig besetzte Rispen und Einzelbeeren zulässig
Black currant panicles may not be completely filled and single berries re allowed

Klasse Extra  

Johannisbeerenrispen müssen voll besetzt sein
Currant panicles must be completely filled

Klasse I  

Johannisbeerenrispen müssen annähernd voll besetzt sein
Currant panicles must be nearly filled

Klasse Extra  

Johannisbeerenrispen müssen voll besetzt sein
Currant panicles must be completely filled

Klasse I  

Sehr leichte Druckstellen
Very slight bruising
Klasse II  
Class II  
Ausschluss  
Out of grade

Unregelmäßig besetzte Rispen bei Johannisbeeren  
Currant panicles may be less evenly spaced

Starke Druckstellen  
Severe bruising

Klasse II  
Class II  
Ausschluss  
Out of grade

Unregelmäßig besetzte Rispen bei Johannisbeeren  
Currant panicles may be less evenly spaced

Starke Druckstellen  
Severe bruising

Klasse II  
Class II  
Ausschluss  
Out of grade

Leichter Saftaustritt  
Slight leakage of juice

Starke Druckstellen  
Severe bruising
Größensortierung  Sizing

Keine Größensortierungsvorschriften  No sizing requirements

Aufmachung  Presentation

Gleichmäßigkeit  Uniformity:
• Ursprung  • Origin
• Sorte  • Variety
• Qualität  • Quality
• praktisch einheitlicher Reifegrad in den Klassen Extra und I  • Classes Extra and I practically uniform in ripeness

Kennzeichnung  Marking

Many thanks for your attention!

Vielen Dank für Ihre Aufmerksamkeit!
Question 1: How has the post-harvest treatment with wax to be specified in citrus fruit?

Answer: The specific marketing standard for citrus fruit (Reg. (EU) No. 543/2011 Annex I, Part B – Part 2, state: 22.06.2011) is valid for oranges, the mandarin group and lemons. It requires the indication “of the preserving agent or other chemical substances used at post-harvest stage”. Waxes are coating agents applied after harvest (and after washing) to reduce transpiration of the fruits and to make the fruits shiny.

For all citrus fruit, whether covered by a marketing standard or not, the German regulation on approval of food additives requires that the post-harvest treatment with waxes (E 901–E 904) must be labelled with „waxed“. Pursuant to article 9(9) this labelling has to be done „on one of the outer sides of the package in case of citrus fruit being sold to other persons than consumers“ and „in case of food stuffs being presented in bulk to the consumer on a plate on or beside the food stuff“ or „on the pre-package or on a label attached to this pre-package“.

It is not obligatory to indicate the type of wax but it may be indicated additionally and on a voluntary basis as the common name or the E-number. For fresh citrus fruit, it is allowed to use the following waxes as coating agents: E 901 beeswax, E 902 candelilla wax, E 903 carnauba wax, E 904 shellac, E 912 montan acid esters und E 914 oxidised polyethylen wax.

If no post-harvest agents are applied the explicit labelling of the „non-treatment“ is not required. Terms like „untreated“ or „free of chemical treatment“ are very dangerous as authorities, courts and consumers understand this statement as the produce being free of any chemical residue (before or after harvest, drift from neighbouring field etc.). „Untreated after harvest“ could be the only indication that might be acceptable.

The indication „with natural wax – untreated after harvest“ is not allowed. Even the treatment with a natural wax like beeswax is a post-harvest treatment. Thus this indication is misleading.

Question 2: To what extent can citrus fruit be marketed that are ready to eat but still have a green peel?

Answer: The specific marketing standard for citrus fruit (Reg. (EU) No. 543/2011 Annex I, Part B – Part 2, state: 22.06.2011) requires for oranges, the mandarin group and lemons that ready to eat fruit have a colouring of the peel typical for the variety, a minimum juice content characteristic for the variety and – where appropriate – a minimum sugar/acid-ratio. The same requirements are fixed in the UNECE standard for citrus fruit (FFV-14, edition 2012) for limes, grapefruit (Citrus paradisi) and pummelos (Citrus maxima). The provisions on maturity of the general marketing standard covering limes, grapefruit (Citrus paradisi) and pummelos (Citrus maxima) are restricted to “a sufficient degree of ripeness”.

Assessing a sufficient degree of ripeness pursuant to the specific marketing standard or the UNECE standard, all criteria must be met (see table). Any deviation is allowed within the tolerances only. Fruits with a peel colour exceeding the limits specified in the standard are allowed within the 10 % tolerance of Class II or the 1 % tolerance of Class I (deviation from the minimum requirements) provided the edibility is guaranteed (juice content and sugar/acid-ratio).
Provisions on the peel colour

<table>
<thead>
<tr>
<th></th>
<th>Specific marketing standard</th>
<th>UNECE standard</th>
<th>General marketing standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lemons</strong></td>
<td>Green but not dark green (minimum juice content is met)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Satsumas, clementines, mandarins and their hybrids</strong></td>
<td>Characteristic for the variety on at least 1/3 of the fruit surface</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Oranges</strong></td>
<td>Characteristic for the variety, light green on not more than 1/5 of the fruit surface; Fruits (varieties) produced in areas with high temperatures and high relative humidity conditions &gt;1/5 of the fruit surface green but not dark green (minimum juice content is met).</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Limes (Persian, Mexican, Indian sweet)</strong></td>
<td>Green but Persian limes max. 30 % and Mexican, Indian sweet-limes max. 20 % of fruit surface with yellow patches</td>
<td></td>
<td>No provisions on peel colour but the fruit must be sufficiently ripe, i.e. they must be juicy and the taste must not be – with respect to the species – too acidic.</td>
</tr>
<tr>
<td><strong>Grapefruits (Citrus paradisi) and hybrids</strong></td>
<td>Greenish on the total surface of the fruit Green, the variety Oroblanco (Sweetie®) (minimum juice content is met)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Pummelos (Citrus maxima) and hybrids</strong></td>
<td>Characteristic of the variety on at least 2/3 of the fruit surface</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sour oranges kum-quats etc.</strong></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Apart from that, the fruits of Classes Extra and I must present the characteristics typical for the variety. The reddish colouration of the peel and the flesh of blood oranges are influenced by the variety and the climatic conditions. The varieties Sanguinello, Tarocco, Maltaise and Moro have a red colouration specific for the respective variety – but the intensity is influenced by the climatic conditions before harvest. At the beginning of the season, there are blood oranges on the market showing limited or no reddish colouration of the flesh.

With respect to the minimum degree of ripeness, the blood oranges must meet the minimum juice content of at least 30 % and a sugar/acid-ratio of at least 6.5:1. In Classes Extra and I, blood oranges meeting the minimum degree of ripeness must show the reddish colouration of the flesh characteristic for the variety.

Any lot of blood oranges with fruit having – based on the reduced sample – absolutely no reddish colouration of the flesh are allowed within Class II only.

**EU Marketing Standard – Table Grapes**

**Question 4:** How are grapes of red varieties such as Crimson Seedless assessed that are only pale coloured but meeting the required minimum Brix value?

**Answer:** Pursuant to the specific marketing standard for table grapes (Reg. (EU) No. 543/2011 Annex I, Part B – Part 9, State: 22.06.2011) fruit must be sufficiently ripe and meet the minimum Brix level fixed for the variety group as well as an acceptable sugar/acid-ratio. In addition to that, the influence of the growing region has to be taken into account when assessing the characteristics typical for the variety. Insofar table grapes meeting the minimum maturity requirements and showing all kinds of hue are acceptable. In Extra Class however, grapes within one package must be approximately uniform in colouring (pale red or deep red).

Any lot of red grape varieties with berries having – based on the reduced sample – absolutely no reddish colouration are allowed within Class II only.

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Question 3: How are blood oranges assessed showing no red colouring of the flesh?

**Answer:** The specific marketing standard for citrus fruit (Reg. (EU) No. 543/2011 Annex I, Part B – Part 2, state: 22.06.2011) specifies only a limit of green peel colouration of oranges.
Question 4a: How are berries of green table grape varieties assessed that have a white, slightly soft fruit flesh?

Answer: This kind of defect is presumably related to first signs of chilling injury; the minimum requirement „sound” is not met. In this stage of development blemished grapes are allowed within the 10 % tolerance of Class II, provided the edibility is not impaired. If the edibility is impaired and/or the flesh shows already a brownish discolouration, one can only make use of the tolerance for decay.

EU Marketing Standard – Tomatoes

Question 5: Why is sizing for cherry tomatoes and cocktail tomatoes not mandatory, although the marketing standard for tomatoes provides appropriate size ranges and the size is tightly coupled with the taste qualities?

Answer: The specific marketing standard for tomatoes (Reg. (EU) No. 543/2011 Annex I, Part B – Part 10, State: 22.06.2011) is based on the UNECE standard FFV-36. Cherry and cocktail tomatoes cover the small fruited varieties of different shapes (i.e. round, oval, date-shaped, pear-shaped, and plum-shaped). The terms cherry and cocktail tomatoes are not clearly differentiated by their size and are mainly used as synonyms. The experts at UNECE were of the view that a mechanical sizing is hardly applied to cherry tomatoes and thus obligatory provisions on sizing should be avoided.

In 2012, the UNECE did integrate a measurable borderline to the so-called normal tomatoes. There the following is in force: „The following provisions shall not apply to trusses of tomatoes and are optional for cherry and cocktail tomatoes below 40 mm in diameter and for Class II.“ In the light of harmonization, this provision might be adopted for the EU marketing standard as soon as possible and – for the time being – can serve as a guide in inspection.

Question 6: Cherry and cocktail tomatoes differ not only in size but also in their internal qualities. Is it possible (and advisable) to use parameters other than size to distinguish the two types?

In addition to the question the following was stated: In cherry and cocktail tomatoes the taste is strongly linked to the size. A general rule says „the smaller the tomato the higher is the sugar content and the lower is the yield“. If only sizing is a method to differentiate, it is possible to mix round cherry tomatoes with round cocktail tomatoes – all fruits of a size between 30 and 40 mm – but the qualities (types) could not be visually differentiated. Is it possible and reasonable to select and apply other parameter than size to differentiate the two types?

Answer: There is no strong link between size and sugar content in cherry and cocktail tomatoes. If a trader wants to be sure that the ordered cherry or cocktail tomatoes have a defined eating quality he / she must add the relevant specifications to the contract.

Moreover, cherry and cocktail tomatoes of different varieties must not be mixed if they are not distinctly different in appearance.

General Marketing Standard / UNECE

Question 7: To what extent are cracks in the stalk of head cabbages allowed – in accordance with the general marketing standard or the UNECE Standard FFV-09?

Answer: The explanatory note developed by the Working Group Quality Control of Fruit, Vegetables and Ware Potatoes for the general marketing standard and applied for headed cabbages says that these may be split provided the split is restricted to the stalk and the tissue is sound and clean. A respective interpretation is also allowed for the UNECE standard (FFV-09, edition 2012).
Question 8: To what extent are shoots in fennel allowed – in accordance with the general marketing standard or the UNECE Standard FFV-16?

Answer: The explanatory note developed by the Working Group Quality Control of Fruit, Vegetables and Ware Potatoes for the general marketing standard and applied for fennel says that the product is regarded as bolting if the flowering stem is externally visible and/or the taste is negatively affected. A respective interpretation is also applicable for the UNECE standard (FFV-16, edition 2010).

Bolting fennel with taste affected is allowed within the tolerances for decay (2 % pursuant to the general marketing standard and 1 % for Class I and 2 % for Class II pursuant to the UN-ECE standard). Bolting fennel with normal taste is allowed within the 10 % tolerance of the general marketing standard or the 10 % tolerance of Class II of the UNECE standard.

It is allowed to remove leaves and to leave stalks of a length of about 10 cm attached to the root or tuber in order to allow the presentation in bundles. Similarly, the presentation of „spiny kohlrabi” is allowed where the leaf blades are removed and the stalks are left to the tuber. However, the remaining stalks must be fresh and sound.

Question 9: To what extent may leaves and/or roots of root and tuber vegetables be trimmed or removed – in accordance with the general marketing standard or the UNECE Standard FFV-59?

Answer: The explanatory note developed by the Working Group Quality Control of Fruit, Vegetables and Ware Potatoes for the general marketing standard allows a product specific presentation / trimming (removal of the leaves or root tips). The same applies for the UNECE standard for root and tubercle vegetables. The trimming of leaves is allowed pursuant to the UNECE standard (FFV-59, edition 2010): „In case of produce presented without leaves, the leaves must be neatly cut at the top of the root“.

When the root tips and/or side roots are removed in the light of product specific presentation, the cut or break must be neat. As a rule of a thumb, the diameter of the cut or break must not be larger than ¼ of the greatest diameter of the root or tuber. Roots and tubers with larger breaks are regarded as „not intact”. But in scorzoneras the root tips must not be removed.

Trimming and cutting that exceed the product specific presentation is not allowed. Slight defects and damages (e.g. feeding damage) that may be removed without additional waste are allowed.

Roots are regarded as „kitchen ready” when the
root is cut at either ends or the root is sliced or diced.

**General Marketing Standard**

**Question 10:** To what extent is internal browning in persimmons allowed?

**Answer:** Internal browning in persimmons is a consequence of the CO₂-treatment being applied to remove the astringency of the fruits. After this treatment the fruits are very susceptible to mechanical impacts that happen during sorting, grading and/or transport. As a consequence, the cell walls of tannin cells are affected and tannins within the cells and intercellular spaces oxidise. This internal browning is a progressive defect that may not be visible at dispatch in the country of origin. The taste is not affected. The defect is either seen as a more or less diffuse browning under the skin or – but rarely to be seen – more or less concentrated in the centre of the fruit.

Assessment pursuant to the general marketing standard (Reg. (EU) No. 543/2011 Annex I, Part A, State: 22.06.2011): The fruits of the reduced sample are cut crosswise at the maximum diameter of the fruit. Fruits showing not more than light browning not exceeding 1/8 of the cut surface are allowed. If the browning exceeds this area or the intensity of browning is higher the fruits are assessed as “not sound” and – as the edibility is not affected – are allowed within the 10 % tolerance.

**Question 11:** Are pot herbs covered by the general marketing standard?

**Answer:** Yes, the general marketing standard applies to pot herbs that are intended for consumption as food stuff. The standard does not apply to pot herbs presented for decoration or as planting material; those are covered by CN-Code 0602 90 30 and thus by annex I part XIII „live trees and other plants, bulbs, roots and the like, cut flowers and ornamental foliage“ of regulation (EC) No 1234/2007.

Pursuant to article 2 of regulation (EC) No 178/2002 food stuffs are „plants after harvest“. For pot herbs destined as a food stuff the removal of the pots from production is the harvest activity.

This is similarly applied for cress and the like presented on substrate and for lettuces offered with the roots.

**All Marketing Standards**

**Question 11a:** How are sales packages assessed that are fogging up inside?

**Answer:** The minimum requirements of all marketing standards include „free of abnormal external moisture“. The OECD adds an explanatory note: „This provision applies to excessive moisture, for example free water lying inside the package, but does not include condensation on produce following release from cool storage or refrigerated vehicle.“ Consequently, the condensation showed on the photo is allowed. However, there is a high risk that the produce in this moist atmosphere
deteriorate quickly. Therefore, the sales packages must necessarily be opened and unpacked for inspection. If no defects (deterioration) can be assessed and a conformity certificate is issued, the period of validity should be defined as short as possible.

**Marking / Labelling**

**Question 12:** Which is the correct name of produce that has to be indicated in case of interspecific hybrids of plums and apricots?

**Answer:** The indication of the produce is not mandatory pursuant to the general marketing standard (Reg. (EU) No 543/2011, annex I part A). In addition, the interspecific hybrids are neither covered by the UNECE standard for plums (FFV-29, edition 2011) nor by the UNECE standard for apricots (FFV-02, edition 2010). Anyway, there is the question on how to inform the consumers properly about the product.

For information of consumers, the indication Plumcot, Pluot® or Aprium® would be beneficial. However, Pluot® and Aprium® are registered trade marks and thus not applicable as a common name and only reclaimable by the licensee. „Interspecific hybrid“ would be the botanically correct marking – but this might mislead and discourage consumers.

As an ideal compromise for marking, the term „plum-apricot-hybrid“ is proposed as the common name for hybrids looking alike Japanese plums and the term „apricot-plum-hybrid“ for fruit looking alike apricots.

Proposal: The UNECE standards for apricots and for plums should be amended by integrating the interspecific hybrids as virtually no trader, inspector or consumer is able to distinguish visually between authentic varieties and interspecific hybrids.

[Editor’s remark: This will be approved by UNECE in November 2013.]

**Question 13:** What is „kitchen ready” or „ready to eat” in the context of the general marketing standard?

**Answer:** There is no definition of „kitchen ready” or „ready to eat” in food law. In the context of marketing standards, the definition pursuant to Reg. (EU) No 543/2011 applies.

All species of fruit and vegetables listed in annex I, part IX of Reg. (EC) No 1234/2007 are covered either by a specific or the general marketing standard. Exemptions are defined in article 4 of Reg. (EU) No 543/2011.

All marketing standards require that the produce must be „intact”. The cut to harvest the produce is not regarded as damaging the produce. But produce that have been damaged in their intactness by mechanical cutting or chopping up do not meet the minimum requirement „intact” any longer. For these produce the exemption pursuant to article 4(1d) of Reg. (EU) No 543/2011 applies. A respective labelling is not mandatory.

When assessing a package the following question must be answered: Are all products in the relevant package physically intact or have they undergone a cutting or chopping up?

- Packages with intact products are covered by the general marketing standard or the specific marketing standards and must be labelled with the country of origin.
- Packages with products cut or chopped up are exempted from the general marketing standard and the specific marketing standards and must not be labelled with the country of origin.
Note: Just washing the produce and eventually packing it with a protective gas doesn’t make a produce a „kitchen ready“ produce with respect to article 4(1d) of Reg. (EU) No 543/2011. Irrespective the labelling with „kitchen ready”, produce covered by a marketing standard must be labelled with the country of origin.

Question 14: Is it allowed to label produce destined for export exclusively in the language of the destination country?

Answer: The language of labelling is only dealt with in the general marketing standard of Reg. (EU) No 543/2011, annex I, part A. There it is said that produce originating in a Member State must be labelled in the language of the country of origin or any other language understandable by the consumers of the country of destination. For other products, this shall be in any language understandable by the consumers of the country of destination.

Consequently, products covered by the specific marketing standards may be labelled exclusively in the language of the country of destination. At the same time, it must be guaranteed that the labelling is understandable in the country of dispatch; so, where appropriate the labelling must be bi-lingual. The labelling in the second language can be provided for each package or on a notice affixed to each pallet.

Question 15: What information must be given in invoices / delivery notes that are destined for the consumer for purchases on the Internet?

Answer: Pursuant to article 5(4) of Reg. (EU) No 543/2011 „the invoices and accompanying documents, excluding receipts for the consumer, shall indicate the name, the country of origin of the products and, where appropriate, the class, the variety or commercial type if required in a specific marketing standard, or the fact that it is intended for processing.”

Consumers pay their purchase in the retail store on the spot. There is no delivery accompanied by an invoice but the consumer gets a receipt. In case of a distance contract (e.g. on the Internet), the purchase is delivered to the customer and the produce must be accompanied by a delivery note or an invoice. In these documents the information particulars listed in article 5(4) of Reg. (EU) No 543/2011 have to be indicated.

Question 16: Which details must be indicated on the package that are delivered to the consumer in case of purchases on the Internet?

Answer: Pursuant to article 5(3) of Reg. (EU) No 543/2011 the information particulars must be available before the purchase is concluded. Pre-packed produce must be labelled in accordance with article 6(2). Products in open sales packages must not be labelled. Therefore, it is important that the invoices and accompanying documents provide the information with respect to the produce, the country of origin and, where
appropriate, the class and the variety.

Note: Whenever a delivered produce does not meet the offer on the Internet with respect to quality class, variety or commercial type and/or country of origin, the invoices, delivery note and products must be correctly labelled. To be on the safe side, the distance seller should already indicate in his offer that possible differences between offer and delivery may occur with respect to quality class, variety or commercial type and country of origin and that the actual marking is valid.

Question 17: Is it permissible to indicate the price by unit and not by weight in case of Hokkaido pumpkins, mini-cucumbers and courgettes etc., which means to sell those produce on a unit and not on a weight basis?

In addition to the question the following was stated: Doesn’t it constitute a barrier to trade, if in any EU Member State it would be allowed to sell fruit and vegetables by unit (e.g. courgettes) while in Germany this is not allowed? It might be necessary to re-pack the produce. When in Germany was the last inventory of the general customary usage in the trade definition made and by whom? Does this issue approach an EU-wide communication?

Answer: Pursuant to the German Regulation on the indication of prices the price must always be given on a weight basis. Exemptions are allowed only if the general customary usage in the trade accepts a price by piece. There doesn’t exist a single list of exempted produce and no specific body that would take care of such a list that could provide a uniform basis for all Federal States in Germany.

Proposal: The Working Group of Quality Control of Fruit, Vegetables and Ware Potatoes could establish a list of products that are accepted to be sold by piece. This list could be submitted to the States advisers horticulture (market) for approval and subsequently be published on the Internet of the co-ordinating authority.
In Germany, the producers of cultivated mushrooms are organised in the BDC (Association of German producers of button and other cultivated mushrooms). This association integrates regional associations such as the provincial society of the Rhineland with its special section on cultivated mushrooms and the Hesse regional section on cultivated mushrooms. By the way, the Hesse regional section with its 75 members from 9 countries (Germany, the Netherlands, Switzerland, Austria, Belgium, Spain, Poland, Czech republic and Hungary) is rather a European association than a German regional section. They specialize on rare species, the so-called exotic mushrooms which comprise all cultivated mushrooms with the exception of common or button mushrooms (*Agaricus bisporus*).

Cultivated mushrooms include the horse mushroom (*Agaricus arvensis*), almond mushroom (*Agaricus blazei murrill*), shaggy ink cap (*Coprinus comatus*), wood blewit or blue stalk mushroom (*Lepista nuda*), oyster mushroom (*Pleurotus ostreatus*), golden oyster mushroom (*Pleurotus citrinopileatus*), pink oyster mushroom (*Pleurotus salmonoeostromaticus*), elm oyster (*Hypsizygus ulmarius*), king trumpet mushroom or king oyster mushroom (*Pleurotus eryngii*), shiitake (*Lentinus edodes*), buna-shimeji (*Hypsizygus tessulatus*), poplar mushroom or velvet pioppino (*Agrocybe aegerita*), hen-of-the-woods, ram’s head and sheep’s head (*Grifola frondosa*), lion’s mane mushroom, bearded tooth mushroom, hedgehog mushroom or pom pom mushroom (*Hericium erinaceus*), comb tooth mushroom (*Hericium coralloides*), golden needle mushroom or enoki (*Flammulina velutipes*). In Germany, the oyster mushroom, king oyster mushroom and shiitake have nearly lost their exotic flair. Economically interesting and marketable species are the oyster mushroom, king oyster mushroom, shiitake, buna-shimeji, velvet pioppino and nameko. The king oyster mushroom was well received by consumers because of its agreeable mouthfeel. In addition, it can be produced more quickly than shiitake and is thus available at a very reasonable price. With its yield of just 10 %, the velvet pioppino is not yet sufficiently yielding.

In Germany, people started to develop cultivated mushroom production in the 1970ties/ 1980ies with first tests. Production started in the 1990ies, was stabilized in the 2000s and further expanded in the 2010s. Button mushroom production grew from 2,500 t/year in 1960 to 62,000 t/year in 2010. Yields amounted to 5-10 kg/m² within 9 weeks in 1960 and increased to 20-30 kg/m² within 5 weeks in 2000. For exotic mushrooms, yield is not determined per m² but according to the amount (%) a substrate yields. For exotic mushrooms, economically viable production at an acceptable market price requires a minimum yield of 20 %. The yields of button mushrooms and exotic mushrooms are comparable, by the way, as 1 m² of bed surface area consumes 100 kg substrate. We expect the exotic mushrooms to experience the same rise button mushrooms have been experiencing since the 1960ies. Note that 90 % of the Hessian mushroom production is organic production. The basic raw material, i.e. the wood substrate, is available in organic quality and chemical pesticides are not allowed.
In the US (2007 about 400,000 tons/year) the percentage of exotic mushrooms is lower than in Europe, while 10 Mio. tons/year are produced in Asia, with button mushrooms comprising just 1% of that total. Accordingly, growing techniques for cultivated mushrooms are much more advanced. Japan, as the home of high technology for cultivated mushroom production, has been producing on a high level of automation since the 1950ies. At a per-capita-consumption twice as high as that in Germany and with 130 mio. inhabitants, the Japanese market is very receptive. At a high level already, particular species still generate high gains.

### Production

Cultivated mushrooms are grown on three different substrata. Common mushroom compost is used for brown and white button mushrooms, horse mushrooms, almond mushrooms, shaggy ink cap and blue stalk mushroom. All other mushroom species are grown on straw substrate or wood substrate (sawdust). The type of substrate used is mainly determined by regional characteristics. Italy and France produce mainly on straw, while the Central-European and Asian countries produce on wood substrate.

Cultivated mushroom production is divided into three highly specialized branches: the production of inoculums, of substrate and of fruiting bodies.

In mushroom production, the spawn is as essential as are seeds in plant production. Spawn production requires the highest degree of specialization and hygiene. The substrate is treated by autoclave, cooled down and inoculated with mother spawn. The spawn then grows in growing rooms.

### Mushrooms and their production

**Mush-room production (in metric tons per year)**

<table>
<thead>
<tr>
<th>Region</th>
<th>Champignon button m.</th>
<th>Austernseitling oyster m.</th>
<th>Shiitake king oyster m.</th>
<th>Kräuterseitling king oyster m.</th>
<th>Sonstige others</th>
<th>Exoten exotic m.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>1,005,900</td>
<td>60,000</td>
<td>3,000</td>
<td>2,500</td>
<td>1,000</td>
<td>3,8 - 6,3 %</td>
</tr>
<tr>
<td>Germany</td>
<td>62,000</td>
<td>700</td>
<td>700</td>
<td>500</td>
<td>100</td>
<td>3,1 %</td>
</tr>
<tr>
<td>Hessen</td>
<td>1,000</td>
<td>500</td>
<td>50</td>
<td>50</td>
<td>20</td>
<td>31 %</td>
</tr>
</tbody>
</table>

Mushroom production in Asia: about 10 Mio. tons/year of which about 99% exotic mushrooms

Pilzproduktion in Asien: ca. 10 Mio. t/J davon ca. 99% Exotenpilze

Quelle: BDC, eigene Erhebung, Schätzung u. div. Literaturquellen
Straw is chaffed and mixed with a starter and water to produce the straw substrate.

Subsequently, the straw substrate is pasteurized, i.e. treated with hot steam at 60–65 °C. Reaction time varies from company to company.

The cooled straw substrate is mixed with spawn, then compressed to form packages which are placed in the incubation room – where oyster mushrooms remain for about 3 weeks and shiitake for 5 weeks.

Once the mycelium has completely captured the packages, the plastic film is perforated for air to enter the substrate. As it is slightly scratched in the process, fruiting bodies can start to develop in growing chambers where the packages are placed. Shiitake on wood substrate, by the way, require high amounts of humidity to avoid any drying out of the substrate. Accordingly, fruiting bodies have a higher moisture content.

The sawdust for production on wood substrate is sterilized in steam autoclaves for 4 hours at 120 °C.

Having cooled down, the substrate is inoculated under sterile conditions. It has a moisture content of 58–60 %. Incubation time amounts to about 4-5 months.
In Asia mushrooms have been produced in bottles since the 1950ies. This form of production has several advantages, such as automated substrate production, short production periods (little space is required), small containers, i.e. the high yield per substrate allows marketing of whole bunches. For oxygen to be able to enter the bottles, their caps/ covers are fitted with a foam plastic pad. The air that enters the bottle is filtered and to minimise the risk of substrate contamination. Production in bottles includes the disadvantage of empty bottles having to be returned. While production in bottles works well with oyster mushroom, king oyster mushroom, hen-of-the-woods and enoki, it is not suitable for shiitake.
At 30 t per day and 7,500 t per year in 2008, the world’s largest production site for enoki is located in South Korea.

In Japan, bottles for enoki production are surrounded with a collar to obtain extra long stems.

In Japan, about 80 % of shitake mushrooms are grown on wood substrate, while 20 % are still grown on tree trunks.

Production sites are much larger in Japan than in Germany. There is one production site, with an annual production of 70,000 t, that equals the annual production of button mushrooms in Germany. This site runs its own substrate production, bottle production and research department.

Controlling climatic conditions is essential for good quality.
Defects in quality

Hygiene is very important in mushroom production! All surfaces must be cleaned and disinfected at the end of each production day. The exhausted substrate must be deadened by steam. In traditional button mushroom production sites, at the end of production the entire room/ chamber which contains exhausted substrate is deadened by steam. Afterwards the substrate is quickly removed from the room/ chamber and taken as far away as possible to prevent contamination of other production rooms/ chambers. Diseases and pests are best prevented by treating the substrate with autoclave and by keeping short production periods. Most of the typical problems are linked to straw substrate. Mistakes made in controlling climatic conditions and hygiene show as defects of the fruiting bodies.

Long stems: CO₂ content and relative humidity are too high; eventually lack of light.

A mushroom’s own mycelium grows from the fruiting bodies in high relative humidity. This is not a defect and must not be confused with mould.

Shape defects / malformations (heads with rough surface): depends on the variety; caused by excessive high relative humidity; edibility is not affected.

Diseases on straw substrate: Trichoderma mould, slime mould, bacterial attack. Bacteria decompose the fruiting bodies and cause slimy flesh; they also produce mycotoxins. Mushrooms affected by bacteria are not allowed for marketing.
Mites and larvae of sciarids are potential pests in cultivated mushrooms.

Variety of shapes

Each mushroom species has a characteristic shape and colour. However, growing conditions have an important influence and may produce different shapes and colours. The buna-shimeji – for example – can be grown with white heads and stems, but grey-brown smooth heads, grey-brown rough heads or light brown, flat heads are also possible.
Grown with a lot of light, the king oyster mushroom produces flat heads and short stems whereas little light yields small, flat heads with long, thick stems or the Asian type with long, thin stems.

The nameko is a small, amber-brown mushroom with a slightly gelatinous coating. As its head is covered with a starchy substance it absorbs water during cooking which makes the mushroom rather dry when it is pan-fried.

Harvest

Mushrooms are absolutely clean when picked – and normally remain so until they arrive at the consumer’s kitchen. Thus, mushrooms need neither be washed nor trimmed. However, mushrooms that are produced with casing material, such as button mushrooms, may have traces of casing material attached to their heads. This can be avoided by careful picking.
Storage and transport

Mushrooms must be stored at high relative humidity of about 98 % and low temperatures of about 1 °C. At these conditions, they keep for roughly 1 week. After that, decomposition might set in.

Although mushrooms grown on wood substrate are not watered, some producers of shiitake dip the production bags in water.

In former times, people were warned not to store mushrooms in plastic bags. Today, however, nearly all mushrooms are sold in plastic packages covered with plastic film. Isn’t that a contradiction? Today’s special plastic films are micro perforated to control the microclimate in the package; i.e. moisture and O₂-content are reduced while CO₂-content is increased. Nowadays, researchers experiment with plastic film that contains salts to control the moisture content in the package.

Summary: Quality depends on variety (strain) and spawn, on substrate and its components, on pasteurization and sterilisation, on hygiene, staff and production site, control of climatic conditions and post-harvest treatment (picking, packaging, storage, transport).
The Pineapple: Production in Central and South America
Thanos Papageorgiou

In today’s supermarkets, the pineapple, an exotic fruit, is part of the standard offer – all year round. It is marketed as a whole fruit – mostly with its crown attached – or freshly peeled and cut in pieces.

Nutrition and health

The pineapple’s contribution to a healthy diet is undisputed. Pineapples are rich in vitamin C (especially directly under the peel), vitamin B1 (which supports the energy metabolism), vitamin B6, manganese, copper, folic acid and fibres. Bromelains, a group of enzymes, are important components contained mainly in the cortex. As they actively contribute to protein fragmentation, they aid digestion. Pineapples do not cause any allergies and the amount of antioxidants is highest in ripe fruits.

Pineapples have an anti-inflammatory and an analgesic effect and they stimulate digestion. They protect against age-related macular degeneration (ARMD) provided one’s diet includes at least 3 portions of pineapple per day.

Botany

The fruit’s scientific name, Ananas comosus, is derived from anãna = splendid fruit/aroma, as the Tupi–Guarani, an indigenous ethnic group in Brazil call the fruit; while Comosus is Greek and means hair or crown.

The pineapple belongs to the Bromeliaceae family. Being a monocotyledone plant, it forms a narrow-leaved xero- and/or epiphytic rosette plant. The fruit is evergreen and self-sterile. The plant is very well adapted to hot, dry climate and takes up water via moisture-absorbing scales on the leaves, aerial roots and leaf axils. Given its CAM-metabolism (Crassulacean Acid Metabolism) the plant is well-adapted to hot and dry climate, i.e. the stomata open only at night to take up CO₂ and store it in the vacuoles as malic acid. Photosynthesis takes place the following day by means of the CO₂ stored. The stomata remain closed during the day in order to avoid any loss of humidity.

Even close to harvesting time, the pineapple plant has a very weakly developed root system which provides only little support.

The fruit itself is an aggregate fruit which develops from 50 to 200 flowers, or rather placentas, around the rachilla. The edible fruit consists of the placenta, the base of calyx and bract which adhere closely to each other, and the rachilla. What we call the „eye“ of the pineapple fruit used to be the flower. The flowers of an inflorescence bloom consecutively, starting from the inflorescence base to continue to its crown. Up to 1.5 weeks can pass between one flower fading and the next one blooming. This is in fact the reason for the considerable discrepancies in pineapples’ ripening periods.
The beauty of pineapples (flowers and fruit) by the way is due to the fact that their shape follows the rules of the golden ratio (proportio divina).

Nature wants to find out how best to arrange as many flowers or seeds as possible on a given area without them later stifling each other in their development. Thus, for the pineapple, the spiral arrangement is the solution. Jil Britton, a mathematician, discovered 5 diagonal spirals ascending to the right, 8 diagonal spirals ascending to the left, and 13 diagonal spirals to the right — figures from the Fibonacci row (0, 1, 2, 3, 5, 8, 13, 21, 34, 55 etc.). The pineapple then, is also a mathematically perfect fruit.

Origin

It is a fruit of the „New World“, originating in South America, in Tupi-Guarani country that is now Brazil (Amazon river to Parana, coastal regions of Paraguay; 10°N – 10°S, 55°L -75°W).

Legend has it, that the fruit was nurtured and further developed by the Tupi-Guarani, warriors and nomads who, after slashing and burning forest lands, subsisted on simple forms of agriculture. The Tupi-Guarani used the pineapple in various ways: as a fresh fruit and as a basis for a fermented alcoholic beverage similar to wine. Fibres of the leaves were twisted to obtain bow strings. Arrows were allegedly dipped in pineapples to increase their effect. Supposedly, the Tupi-Guarani were the ones who spread the fruit along Brazil’s coast from where it continued all the way to the Caribbean Islands and on to Central America.

Distribution

Europeans first came in contact with pineapples in 1493 when Columbus, during his second trip, went to the island of Guadeloupe. The discoverers were enthusiastic about the aromatic sweetness, the particular taste and shape of the fruit. They brought it to Spain where even King Ferdinand was pleased to experience the pineapple’s agreeable sweetness and aroma. As of that moment, nothing stood in the way of its distribution. What’s good for a king can be nothing short of desirable for the aristocracy and the common people.

In subsequent years, Spanish and Portuguese sailors took the pineapple as far as India, Java, Southeast Asia, West and East Africa and even Hawaii.

In Europe, the pineapple was successfully cultivated in Holland for the first time at the end of the 17th century, when the modern greenhouse was developed. Oakwood flour was used as bottom substrate to maintain constant soil temperatures.

In the 18th century, pineapple cultivation spread across many European countries. Royals and aristocrats were particularly thrilled by the exotic fruit and growing it soon became a status symbol. In England, people were truly euphoric about pineapples. A painting by Hendrick Danckerts (1677) depicts Mr Rose, the royal gardener, handing the first home-grown pineapple over to King Charles I. In 1689, John Locke enthuses: „Let him try if any words can give him the taste of a pineapple“. Apart from the nobility’s „Pinaries“ and until the end of the 19th century, pineapple fruits and plants as well as cuttings were also produced commercially. When imports from the Bahamas and the Acores increased considerably (due to steam boats first and refrigeration vessels later), local cultivation
was no longer profitable. Intensive horticultural activity in England for over 200 years, by the way, contributed much to variety development.

Canned Pineapples

In 1810, Nicholas Appert, a confectioner and chef in Paris, after 15 years of experimenting, presented a patent for the conservation of foodstuffs. He was awarded 12,000 Francs for this achievement by Napoleon who could certainly make good use of canned food for his troops. Appert published his findings in „L’art de conserver les substances animales et végétales“. In 1811, the food can, an iron sheet dipped in melted zinc, was born. In 1876 already, pineapples were canned on the Bahamas as well as in Malaysia, Singapore, Thailand and the Philippines. Between 1830 and 1950 there were 110 canneries in Baltimore. 1892 Zastrow machine. The first cannery operated between 1892 and 1898. In 1893, Lewis invented a machine that could peel four pineapples per minute.

In 1895, John Kidwell, a young gardener from England, started to grow pineapples in Hawaii. He tested the varieties from England and found a particularly good one: Smooth Cayenne. From Hawaii, this variety found its way across the world and was, until a few years ago, the most frequently grown variety. Given the high import duty of 35 % due in the USA, the pineapple business was not worthwhile and Kidwell switched to growing sugar cane.

In 1899, James Dole began to trade coffee and fresh pineapples. In 1900 already, 250,000 boxes of fresh pineapples were exported by the Bahamas. In 1902, Dole opened the first cannery in Hawaii (Hawaiian Pineapple Company), followed by the Maui Pineapple Company by Del Monte. Thanks to Henry Ginaca’s engineering skills peeling and de-coring machines constantly improved: Numbers of peeled and de-cored pieces/minute rose from 65 between 1911 and 1919 to 100 in 1925.

Pineapples were first advertised in 1908. Advertising them became necessary because as a result of the financial crisis (1907 Bankers’ Panic), only 12,000 of 400,000 boxes produced had been sold. The slogan: „Don’t ask for a pineapple, insist on Hawaiian pineapple“ promoted the labelling of origin. Both the Pineapple Growers Association and the Pineapple Research Institute of Hawaii (until 1975) were founded. In 1940, Hawaii had a world market share of 70 % and was the biggest producer of canned pineapple. In 1882, Mr. Landau began to produce canned pineapple in Malaysia and was a large producer of cans until World War II. Today, Thailand and the Philippines dominate world trade in canned pineapples.

A wide range of varieties

There are three pineapple varieties of economic relevance:

*Ananas comosus var. erectifolius* has long sword-like leaves. It is grown for fibre production. Its fibres are very resistant, flexible and biodegradable. They are used for textiles, for nets and in the car industry. The production area is in Curauá, Amazonia, in Guyana, i.e. in the Orinoco Basin.

*Ananas comosus var. ananassoides* might look like the pineapple which the Tupi-Guarani found in the woods: small fruit with a large thorny crown.
Ananas comosus var. comosus is divided into five varietal groups:

- Red Spanish, probably brought to the Philippines by the Spaniards, is practically grown all over South Asia today, but also in the Caribbean and in Singapore, to be canned.

![Red Spanish](image1)

- Pernambuco (also called Perola), is the variety which prevails in Brazil. Its fruits are egg-shaped or conical, its pulp is white and slightly yellow in the centre of the eyes. The variety is Phytophthora resistant.

![Pernambuco (Perola)](image2)

- Queen (also called Victoria), is quite widespread in South Africa, Australia and Mauritius. Its plants are small and robust yet not Phytophthora resistant. The fruit is small as well, its eyes are protruding, crown leaves are thorny. Its pulp is yellow, sweet and aromatic. This variety arrives in Germany by air.

![Queen (Victoria)](image3)

- Smooth Cayenne was brought to France from French Guyana in 1819 by Perrotet, a Frenchman. It was grown and further cultivated in Europe and spread across the world years later, via England and Hawaii. In French Guyana itself (with its capital city being Cayenne) by the way, the fruit is called Maipury. The fruits reach a weight of 1.5-2.5 kg. Their production cycle is relatively long. The fruit is very susceptible to internal browning and to fusariosis but is Phytophthora tolerant. Depending on the growing area, the pulp is either whitish or slightly yellow. Fruits ripen progressively, i.e. they ripen and gain colour from bottom to top. Uneven degrees of maturity and a strong gradient are characteristic. Brix value varies between 13 and 19° Brix. While its acid content is high the fruit has only little vitamin C. Due to its acidity and internal browning, customers were often disappointed.

![Smooth Cayenne (Cayenne lisse)](image4)

- MD2 (Golden Pineapple) was bred at the Pineapple Research Institute of Hawaii. MD2 is directly related Smooth Cayenne. The fruit is cylindrically shaped so as to fit into a can entirely. Also, its skin colour is nicely orange-yellow. Its pulp contains less acid than the pulp of Smooth Cayenne but much more sugar and vitamin C. Due to its high vitamin C content MD2 has a very good shelf-life (no internal browning!). Yet, in Hawaii MD2 did not grow particularly well. It is only when the variety reached Costa Rica that it became triumphantly successful. Nowadays in Europe and North America, the variety is a synonym for fresh pineapple.
Producer and Supplier Countries

Pineapples are mainly grown in Brazil, India, China, the Philippines, Thailand and Costa Rica. While the former produce mainly for their internal markets, Costa Rica’s production (on about 45,000 ha) is mainly destined for export. At 1,600,000 t (2010) or 0.5 billion US$ Costa Rica is the largest pineapple exporter worldwide.

There are other exporting countries, such as the Ivory Coast, which has considerably diminished in importance in that respect, as well as Panama, Honduras, Guatemala, Ghana and Ecuador. In Costa Rica, the Golden Pineapple (MD-2) is grown almost exclusively, with production areas being distributed in the northern (50 %), Atlantic (33 %) and Pacific regions (17 %).

Costa Rica has ideal production conditions for pineapples, with minimum temperatures between 20° and 23 °C and maximum temperatures between 33° and 35 °C and 20-160 mm of rain. (Perfect conditions would be rain at night and dry weather during daytime).

Cultivation

The ground must be broken up and ploughed. Good drainage is of particular importance – the deeper the better. Then, the planting beds are prepared.

Beds are planted in double rows and by hand, with 72,000 plants/ha.
Pineapple fields’ ideal topography is slightly corrugated for water to be able to drain off.

The soil is fertilized before planting the suckers. During growth, foliar feeding occurs according to need: prior to flowering, more nitrogen is required, while potassium is needed after flowering (higher Brix value, better sugar/acid ratio). Plants are sprayed (with water) if need be.

Plant protective measures are necessary against symphilidis which eat the root hairs or bore root channels but also against snails, the pineapple mealy bug, ants, pineapple scale, thripses and mites. The pineapple mealy bug transmits the pineapple wilt virus. This unwelcome virosis can only be fought by fighting the ants which, by feeding on the mealy bug’s honey dew, transmit the wilt virus. Stagnant water (ponds) in the field fosters the propagation of Phytophthora and the total loss of affected plants.

Natural inflorescence induction is determined by an array of factors and can lead to the very non-uniform flowering of a field. In commercial production, however, the entire field should flower as uniformly as possibly. Hence, flowering is induced artificially – about 7 to 9 months after planting or as soon as the plant weighs ca. 2.2 to 3 kg. For that purpose, ethylene (or ethrel) is bound by activated charcoal to be sprayed on the fields along with water. A few weeks after the ethylene was applied one can see how the plant opens in the middle and how the inflorescence appears.
As, during flowering, blossoms may be infected by thielaviopsis, fusarium and penicillium fungus spores, spraying or fertilisation should be avoided during that phase. Also, a butterfly, the Pineapple borer (*Thecla basilides*), lays its eggs on the pineapple leaves. Its larvae emerge and bore into the fruit. The plant/fruit reacts by forming a gummy substance (gummosis).

Fruits are wrapped for protection against sunburn.

5 to 6 months after the flower has appeared, the fruit can be harvested (and is ready for consumption as well, because the pineapple is a non-climacteric fruit). Ripening begins at the fruit base and continues towards the crown. The pulp is white at first, hard and completely dry. As the ripening process continues, the pulp becomes juicier and turns yellow as carotinoids are produced. Two to three days after having attained 60% of its ripeness the fruit can be harvested.
As soon as the fruit has reached 60% of its ripeness it can be de-greened. Ethephon, a liquid ethylene generator, is sprayed directly on the fruit. Ethylene leads to chlorophyll degradation which always starts in the centre of the eye and spreads outward. Whether de-greening is effective depends on many factors, such as air temperature, direct solar radiation, rainfall etc. Yet, it is possible to harvest an optimally ripe fruit with its skin still green. Green pineapple skin does not necessarily stand for a lack of internal maturity.

Ernte und Aufbereitung

3 to 4 days after de-greening, fruits can be harvested – which always happens manually. A fruit is held at its crest, then slightly twisted and bent, then placed on the conveyor belt. Pineapples must be handled with utmost care; this includes careful piling in the trucks. Otherwise, sunken lesions (necrosis) occur.

At the packing house, the fruit are immersed in a water bath to be washed and – in case of long distance transport – they are treated with wax and fungicides, even though only one fungicide, hardly efficient, has been approved. New and more efficient fungicides are available yet unapproved for pineapples, as producers have no interest in costly approval procedures. After being treated, pineapples are packed, palletised, chilled to 7.5 °C and shipped to Europe, either in containers or on refrigeration vessels (below deck) where they arrive after ca. 12 to 14 days and have a maximum shelf life of 2 to 3 weeks, provided the cold chain is not interrupted.
Production cycle

The production cycle described above, during which the main crop is produced and harvested, is called Plant Crop. If the plant is left to grow for another 5 to 6 months after the first harvest, a new flower can be induced (similar to the Plant Crop). After yet another 5 to 6 months, this inflorescence will supply another harvestable fruit, the so-called Ratoon Crop.

Theoretically, even a third harvest would be possible yet not viable economically. In general, plants are either cleared/removed after the 2nd harvest or they are used to produce new suckers.

In Costa Rica, 7 to 9 months pass between planting and floral induction while in Hawaii, 9 to 13 months pass between both events. In Costa Rica, 5 to 6 months pass between flowering and harvest; in Hawaii, 6 to 7 months pass between both events. In case of ratooning, 5 to 6 months pass between the first harvest and floral induction in Costa Rica, while in Hawaii 5 to 7 months pass between both events; between floral induction and harvesting, 5 to 6 months pass in Costa Rica and 6 to 7 months in Hawaii. In Costa Rica, suckers are used as plant material. Their production can take up to 8 months. In Hawaii, preference is given to crowns as plant material.

Quality defects

Fruits showing the following defects are excluded from export: a crown of excessive length, a bent crown, multiple crown, bruises (sunken lesions), brown base (an external defect only, in case the skin came in contact with humic acid), Thielaviopsis rot (Thielaviopsis paradoxa), dry rot within an eye (fruitlet core rot), sunburn, mealy bug (Dysmicoccus brevipes), chilling injury (due to a longer period below 7.5 °C), seed production in the fruit (pineapples are self-sterile but pollen are fertilised by another variety), pulp browning (classic defect of Smooth Cayenne), mould at the cut surface, reddish brown skin colour (due to excess amounts of Ethephon), or a burnt crown (a new defect, probably on fruits which are harvested early in the morning and, immersed in water with their stomata open, absorb water).
**Braune Basis**
*Brown base*

**Thielaviopsis-Fäule**
*Thielaviopsis paradoxa*
Tv-Rot

**Trockenfäule in einem Auge**
*FCR – Fruitlet Core Rot*

**Sonnenbrand**
*Sun burn*

**Schmierläuse**
*Dysmicoccus brevipes*
*Mealybugs*

**Kälteschaden**
*Chilling Injury*

**Frucht mit Samenansatz**
*Seeded fruit*

**Fleischbräune**
*Internal Browning*
Upon arrival in Hamburg, the fruits undergo a serious quality check. They are peeled and cut into thick slices crosswise. The fruit’s internal ripeness is determined by the colour and translucency of the flesh. Brix value, level of acidity and vitamin C content are measured and the sugar/acid-ratio is calculated. Only ripe fruits are marketed.

Marketing and Consumption

In Germany, one half of the amount of fresh pineapples is sold in supermarkets, the other half is sold through discounters. In total, sales are clearly declining – surely not because of the retail price, given the fact that pineapples are sold at a price lower than that of domestic apples. Unripe fruit are increasingly offered on the market. Probably because trade continues to demand ever-declining prices. As it is only at the harvesting stage that a producer can reduce costs, he will harvest an entire field in one go - and include unripe fruit - instead of picking only ripe fruit on a given day. Both traders and producers must break this vicious circle in close co-operation.

In the shop, consumers should best select a fruit which shows the characteristics of the variety. After they purchased it, they should store the fruit for 1 or 2 days at ambient temperatures. This allows the fruit to become juicier and more aromatic. Freshly cut and/or in fruit salads, a pineapple will keep for 6 to 9 days, refrigerated at +5 °C. Thanks to the fruit’s high contents in antioxidants, no significant changes will occur during this time.

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O Abacaxizeiro. Cultivo, Agroindústria e Economia

Getúlio Augusto Pinto da Cunha, José Renato Santos Gabral, Luiz Francisco da Silva Souza. Embrapa
Quality Pineapple Production in Ghana
Abena Safoa Osei

Pineapple production in Ghana gained economic importance over twenty years ago. Since then it has gradually become one of the three most important horticultural produce – the other two are mango and papaya. The pineapple industry is however the most stabilized industry. The biggest market that Ghanaian pineapples have is the European market.

The Ghanaian pineapple industry cultivates three main pineapple varieties – Smooth Cayenne, Sugar Loaf and MD2. Queen Victoria is grown on a small scale. With the introduction of the MD2 variety, this quickly became the preferred variety in the European market. Ghana quickly made every effort to meet this demand and increase our market share.

Another request from customer was the increasing private standards requirements along with the EU statutory requirements which the average Ghanaian farmer was not used to. The industry, together with governmental assistance and donor support trained farmers to understand and implement the private standard requirements as well as the peculiar requirements of MD2 cultivation.

Today the Ghanaian industry can boast of expertise and adapt quality and good agricultural practices meeting international requirements. The expertise spans from pineapple production to the final quality inspection of the produce.

Quality Pineapple production begins with the right land preparation; for the MD2 variety there is the need to mulch the mounds for planting.

All the pineapple producers producing for the export market are GlobalGAP certified. A good number of small holders belong to a group certification scheme. However, assistance is given to ensure the farmers continually implement the GlobalGAP requirements.

Another important aspect of quality production is the sourcing of healthy and viable planting materials. This is also available for most of the farmers.

The Pineapple industry has a very viable association – the Sea-freight Pineapple Exporters Association of Ghana (SPEG). SPEG works with the Ministry of Food and Agriculture to train the farmers and their workers in the implementation of relevant market requirements as well as minimum good agricultural practices. Farmers are trained to maintain their pineapple farms as well as:

- Apply plant protection chemical correctly,
- Keep relevant records,
- Apply irrigation and fertilization requirements
- Right flower induction and harvesting time, etc.

These examples are critical in the final quality of the produce.
Pineapples ready for harvesting are carefully harvested into crates and taken to the pack house where they are sorted (graded). Each pineapple is visually inspected against documented external quality parameters such as mechanical injuries, well formed “eyes”, right colouration, etc.

The accepted pineapples are again sampled and inspected against internal quality parameters. There shouldn't be internal discolouration and the pineapple must not be over ripe (this is usually checked by the translucency of the fruit).

Finally the accepted fruits are washed (and waxed depending on the market and customer requirement). Fruits are then weighed and graded according to the weight and colour.

**National Efforts to ensure quality pineapple production**

With the advent of the increasing market requirements which is not a usual requirement
on our local market it became evident that it would be necessary to implement a national quality assurance scheme for the pineapple industry.

The aim of the project was

- To make Ghanaian pineapple producers aware of quality standards and their benefits to the industry;
- To imbibe quality into the procedure and the final output of the producers;
- To increase the overall quality and competitiveness of the Ghanaian produce on the International market.

The project was piloted with ten SPEG members. In this farmers and their workers were trained to understand the implementation requirements of the National Standard for Pineapple (which is harmonized to the UNECE and CODEX standards). Pineapples were inspected regularly at the ten selected pack houses and again at the harbour. Inspections were done by an independent inspection body. The inspections and pack house activities were audited by the Ghana Standards Board auditors – to ensure right interpretation of standards.

The project revealed that having a local quality assurance system independent of the private standards requirements was a big boost to the existing quality assurance of produce. It increased in general awareness of the national pineapple standard and a better understanding of client specifications by pack house staff. Finally, exporters experienced a marked reduction in customer complaints or even an improved customer feedback – they were impressed with the quality of the produce.

Now there is an on-going programme to establish an EU Competent Authority for the export of fresh produce to the EU. This will enforce more stringent quality requirements thereby increasing the produce.

Another project is on-going to establish a big planting farm to ensure the availability of high yielding pineapple suckers.

Way forward

- The need to implement such a programme for all fresh produce.

Ghanaian pineapple has excellent taste and with the National and individual efforts the industry is continually improving to supply high quality pineapples.

Buying Ghanaian pineapples assure you of excellence in quality and taste!
UNECE-Standard and Explanatory Brochure on Pineapples
Ian Hewett

I am going to talk to you about the UNECE quality standard for pineapples and the explanatory brochure on pineapples.

I have been involved for the last two years in development of the explanatory brochure which is expected to be published later this year.

Prior to involvement in this project I had not had much involvement with this product. Pineapples are a product that - as an inspection body in the UK - we had not been interested in until the change of regulation in 2008 which introduced the general marketing standard.

However, together with the input of experts from Ghana, South Africa, Thailand and elsewhere, myself and others attending the UNECE Specialised Section for Fresh Fruit and Vegetables have amended the text of the standard and put together an explanatory brochure.

My first slide gives some information on imports into a number of EU Member States. Imports have been growing significantly over the last decade, even if the chart does not show much growth in some countries over the last 5 or so years.

Pineapple imports

<table>
<thead>
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<th>000 Tonnes</th>
<th>2005</th>
<th>2007</th>
<th>2009</th>
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<tr>
<td>Germany</td>
<td>260</td>
<td>280</td>
<td>305</td>
</tr>
<tr>
<td>Spain</td>
<td>170</td>
<td>240</td>
<td>235</td>
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<td>UK</td>
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<td>220</td>
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</tr>
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<td>France</td>
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</tr>
<tr>
<td>Netherlands</td>
<td>200</td>
<td>180</td>
<td>140</td>
</tr>
</tbody>
</table>

Source: Faostat

What is clear is that there has been a growth in dominance certainly into the UK of fruit from Costa Rica, and production has doubled in that country from 1 million to 2 million over the last 6 years. The EU imported around 900,000 tonnes of pineapples from Costa Rica alone in 2010. The affect this has had on availability of pineapples in the UK has been significant and it has led to year round availability and all supermarkets having fruit available for £1 or less.

The next slides summarise many of the photographs and text that will appear in the explanatory brochure.

The full text of the standard and more photographs and explanatory text can be found on the UNECE website.
Minimum requirement: “sound”.
Rot in one eye — not allowed

Minimum requirement: “sound”.
Severe bruising — not allowed

Minimum requirement: “sound”.
Chilling injury — not allowed

Minimum requirement: “sound”.
Internal breakdown — not allowed

Minimum requirement: “sound”.
Excessive soiling (left), pest residue (right) — not allowed

Minimum requirement: “clean”.
Excessive soiling (left), pest residue (right) — not allowed

Minimum requirement: “practically free from pests”.
Colony of mealy bugs — not allowed

Minimum requirement: “practically free from pests”.
Colony of mealy bugs — not allowed

Minimum requirement: “practically free from pests”.
Colony of mealy bugs — not allowed

Minimum requirement: “free from damage caused by pests affecting the flesh”.
Damage caused by Augosome beetle — not allowed

Minimum requirement: “free from damage caused by pests affecting the flesh”.
Damage caused by Augosome beetle — not allowed

Minimum requirement: “stalk not longer than 2.5 cm; the cut must be transversal, straight and clean”.
Stalk > 2.5 cm (left) — not allowed except during transport; stalk ≤ 2.5 cm (right) — allowed in all classes

Stalk length

Maturity requirements

Photo 2B.2: Maturity requirement: “appropriate degree of maturity and ripeness”. Stages of ripeness: fruit on the left is sufficiently mature, provided the minimum Brix level is met
Maturity requirements

Stem part: 13.6 °Brix  Middle part: 13 °Brix  Crown part: 10 °Brix

Maturity requirements: “total soluble solids content should be at least 12 °Brix”. Gradient of total soluble solids (example)

Class I

Crown not exceeding 150 per cent (left) or crown under 50 per cent (middle) of the length of the fruit, inclination at 30° from the longitudinal axis of the fruit (right) — limit allowed

Maturity requirements

Skin colour

Maturity requirements: “skin colour”.
Naturally opened non-degreened fruit (left), degreened fruit (right) — allowed in all classes

Class I

Slight shape defects – missing eye
Slight defects in colouring – Slight sunburn

Maturity requirements

Skin defects not exceeding 5 per cent of the total surface area. Limit allowed.

Class II

Crown exceeding 150 per cent (left) or crown inclination exceeding 30° from the longitudinal axis of the fruit (middle) or double crowns — Allowed

Extra Class

Characteristic of the variety – slight superficial defects
The final two slides show a field of pineapples in South Africa and, by contrast, the last photograph shows traditional pineapple production techniques in the UK used over 200 years ago. The use of sizeable glass houses, a lot of labour and a lot of manure allowed the upper classes to enjoy the occasional pineapple, but at a lot greater cost than the £1 or less I can now buy pineapples for.
Quality production of peaches and nectarines in France
Karl-Eric Chéron

Definition of Quality: The standard ISO 8402 Quality management says „the quality defines itself as all the characteristics of a product which confer it the capacity to satisfy the explicit or implicit needs of the consumer”.

The quality of peaches and nectarines produced in France depends at first on a master of the production and on a good survey along the marketing chain. All the strategies are developed around an approach: the expectation of the consumer for peaches and nectarines. In this context, the varietal choice in production has its importance.

Production

In France, the total production surface for peaches and nectarines was about 12,300 ha in 2012. The production is estimated 280,700 t for 2012. The economic difficulties and the grubbing up due to Sharka (Plum Pox Virus) caused the reduction of the production surface by 11 % in the average of the 5 previous years.

In France three regions represent more than 90 % of the national production: Languedoc-Roussillon (5,200 ha), Provence-Alpes-Côte d’Azur (3,000 ha) and Rhône-Alpes (2,700 ha). The reason for this concentration is that these regions have the best weather (period of sunshine and temperatures), i.e. best growing conditions for peaches.

The major risks are spring frost and hail. The humidity is also an important factor and must be taken into account. A wet atmosphere favours the development of fungal diseases such as Monilia. These diseases result from the orchard but appear later during the marketing of the product. Many commercial rejections are because of Monilia.

Agronomic Aspects

Peaches require a neutral soil, good irrigation and normal humidity. The height of the trees is 2-5 m. The trees are in full bloom at the beginning of spring. Hives are placed in the orchards to guarantee a good pollination. Generally, orchards produce over a period of 15 years.

Choice of the good variety: The producers play on the calendar of the market, i.e. they grow a range of varieties that allows harvesting for 4 months – from June to September. Producers have in average 50 to 60 varieties. The harvest of one variety lasts 15 to 20 days with an average frequency of passage from 2 to 3 days for the premature varieties and from 4 to 6 days for late varieties. The maximum efficiency of an orchard is between 4 to 11 years. The yield is 30 to 45 t/ha according to the variety.

Orchard practice

Protection and management of orchards: Producers ensure the good health of their orchards throughout their development. Apart from specific technical practices such as pruning and thinning, it is also necessary to avoid attacks by pests and diseases. Some preventive treatments are applied to key periods to avoid pests.

Pruning: Firstly, pruning is used to clean the trees, i.e. removing dead branches, intersecting branches, damaged wood and branches with mummified fruit still attached. Good pruning facilitates thinning out in spring. Pruning allows optimal lighting in the tree and reduces the risk of diseases like fungi. It also decreases the risk of friction and fruit contacts.

Fruit thinning regulates and optimizes the production and fruit sizes and reduces hiding places for diseases and parasites.

Harvest

Picking is still manual in spite of attempts
at mechanisation. The fruits are delicately deposited in boxes containing maximum 8 kilos of fruits. Manual picking allows an initial qualitative selection and unshakeable fruits can be removed. Fruits on a tree do not all mature at the same time due to their position in the tree. Thus, picking is made in several passages, 5 to 8 passages are made by tree in the same orchard to pick only fruits that reached maturity.

The eating quality is composed of aroma, sugar, acidity, texture, and juiciness. After picking it is very important to take any measures to maintain the firmness and the over-all quality of the fruit. However, the decisions taken before harvest such as soil, root-stock, planting density, crop management (fertilization, irrigation), pruning, thinning-out (yield and calibre), and picking have an influence on fruit size and firmness.

Peaches and nectarines are climacteric fruit. Those have a phase of development and maturity, where the fruit grow in size and accumulate reserve substances and a phase of (climactic) ripening, where ethylene is produced and the physical-chemical factors (firmness, aroma, sugar, acid) are decomposed to final senescence.

Peaches and nectarines are picked at a firmness of 4-6 kg/0.5 cm².

Post-harvest / Pre-export practice

Conditioning: The fruits are quickly transported to the pack house. There, every lot is subject to a strict maturity check (sugar content and firmness). Defective fruit are outgraded and the lot is graded according to size and eventually to colouring.

Storage: Peaches and nectarines are not a real storage-produce. But they can be stored for some days (less than 2 weeks) at 0–2 °C.

Controlled ripening: After sorting and grading and eventually cool storage, the fruit are ripened to eating quality within 1-3 days at 20–25 °C (recommended 22 °C) an 85–90 % relative humidity. Depending on the variety, the firmness must be checked once or twice a day. The firmness decreases by 1.3 kg/cm² per day at 20 °C. The sugar content remains stable, the acid contents decreases slightly and the ground colour is improving slightly.

Trade

Extrinsic characteristics of peaches and nectarines are colour, shape, defects, homogeneity, and size.

The professionals agreed to ban the marketing of peaches and nectarines produced in France with a size less than 56 mm. Studies confirm that consumers are attracted by sweeter and bigger fruits (varieties).

Intrinsic characteristics of peaches and nectarines are the physical and chemical characteristics of the fruit. These characteristics are quantifiable by tools and most of the tests are destructive.

- Acidity: The acidity is a characteristic typical for the variety. It is a rather stable character that decreases only slightly. The varieties can be classified – in accordance with the content of acidity – in three groups: 1) slightly sour < 9 meq/100 ml, 2) balanced = 9-12 meq/100 ml and 3) sour > 12 meq/100 ml. Consumers prefer well-balanced or slightly acid fruits.

- Sugar: The content is measured by means of a refractometer (electronic or not) or NIR (near infrared spectrometry, a non-
destructive method). Taste panels could prove that consumer satisfaction is increasing in all three taste groups when the sugar content is increasing. However, consumer satisfaction requires more than 9 °Brix, which is more than the minimum of 8 °Brix required by the EU standard.

Sensory evaluations by trained panellists were carried out with peaches and nectarines. First the fruit were evaluated qualitatively (this peach is sweet) and quantitatively (this peach is very sweet). After that the fruit are classified (peach A is sweeter than peach B). These checks are completed by hedonic checks carried out by untrained consumers. This is done to reveal a classification (which sample tastes better), hedonic satisfaction (report on specific characters) and acceptance (report on the product). These checks reveal the influence of different picking dates on parameters like aroma, smell, firmness, sweetness, acidity, juiciness, mealinens, fibrousity and elasticity on the quality of the fruit.

French Labels

„Label rouge“ or „red label“ was created in 1987. It is a specification sheet on quality production and addresses the consumers’ expectations.

„Les vergers éco responsables“: Since 2011, the Peaches of our Regions are associated with the new identity „Orchards eco responsible“. This constitution on quality is mainly a business to business tool but addresses the consumers too.

The naming is based on three inseparable pillars:

Environmental: The producers implement framed practices such as the preservation of the biodiversity in orchards, limitation of the recourse to synthetic products, or limitation...
of the impact on the water pollution and the grounds. The farms are certified „GlobalGap“, and the great majority of the pack houses are certified „IFS“, „BRC“ or other reference tables environment, quality and method adopted by numerous distributors.

Social: The eco-responsible orchards also mean that the producers respect men and women who work on his/her premise. Fruits are handpicked by qualified employees who benefit from the social welfare recovering from the law.

Economic: Applicant of the sharp agricultural and technical skills, the sector of fruits establishes one of the most important employers of hand of agricultural work in France. With its 15,000 ha, the production of peaches employs on France 15 to 20,000 permanent or seasonal employees.

To buy French peaches and nectarines of „Eco responsible orchards“ is a public-spirited act! To guarantee that each of the actors living on his work while selling their produce at a fair price, without scoffing at production processes and by respecting all the stages (quality control, traceability) which guarantee the excellence of peaches and nectarines of our regions.

„Pêche d’ici®“ is a generic trademark for the French peaches that are colourful, tasty and rich in varieties, e.g. the white fleshed peach has a very specific sugar-acid-ratio while the yellow fleshed peach has a more classic taste.

„Pêches de nos Régions“ is a trademark addressing the consumer and it is supported by the French producers of peaches and nectarines. They do all to promote the sector and to approve and up value the quality, to inform the consumers, to operate in a sustainable manner, to increase the consumption and to feed 20,000 direct and indirect employees. Their advertisement is through slogans as „The Peach of our Regions tempts us!“ or „Peaches of our regions – the coronation of the stars!“

Peaches and French nectarines are historically considered as the best from a gustative point of view. Today, the French production is faced with strong foreign competitors offering products at lower price, but different in quality. How make sure then to buy a quality product and consequently to offer a great taste? The only way is by recognizing the origin of the product and by selecting the quality. The peaches of our regions are proud and sign their difference! From the beginning of June to the end of September, in view of the guiding theme „Peaches of our Regions“ no hesitation!

We are in the presence of a star of the family of peaches and nectarines! Let us take, let us taste, let us savour, and let us judge by ourselves: A juicy, sweet, sun-kissed peach of the South of France which received all the care of the producers.
Quality production of peaches and nectarines in Chile
Juan Pablo Zoffoli

China is the world biggest fruit producer and Chile is relatively small. However, Chile is the most important producer in the Southern hemisphere. Chile is a long country at the Pacific Ocean, surrounded by competitors mainly producing subtropical and tropical fruit.

Chilean fruit production is mainly oriented for export and includes a broad range of species. Table grapes and apples are considered the biggest with 794,000 tons each. Avocados and blueberries become very important crops in the last 10 years with 81,514 and 54,296 tons, respectively.

Stone fruits, such as sweet cherries, apricots, plums, peaches and nectarines, sum up to 235,242 tons, with sweet cherry being the most planted species during the last ten years.

The production of peaches and nectarines covers a surface of 19,244 ha in Chile; almost 6.5% of total Chilean fruit surface area. Fresh peaches and nectarines and canned peaches represent 2%; 3.1%, and 1.1% of total fruit production, respectively. Fresh peaches and nectarines are mainly produced for export. A total of 86,000 tons were exported in the 2011/12 season while USA is the main market (55%) together with Latin American countries (23%), and Asia and Europe are secondary with 8%, 14%, respectively.

The peach and nectarine growing areas extend from Chilean regions V (Valparaiso) to VI (Liberador General Bernardo O’Higgins); the production varies within a period of November to March, because of a large diversity of varieties introduced mainly from USA nurseries.

The Mediterranean climate with dry summer and rainy winter allows irrigated fruit production using good agricultural practices with minimum use of pesticide. Brown rot blossom blight affects (Monilia laxa, M. fruticola) flowers in some years; but grey mould (Geotrichum candida) and sour rot (Betrytis cinerea) appear during storage as the main post-harvest diseases in some rainy years.

Peach and nectarine production in Chile are concentrated for export. Fruit transport extends from a period of 15, 30 or 40 days depending on USA, Europe or China markets, respectively. The restriction to export to long distant markets, such as Europe and Asia is mainly related with sensitivity of the species to internal disorders, peach varieties being the most sensitive. Causes of fruit deterioration during this period need to be established for every variety in order to achieve the quality required by the consumer.

Fruit quality assessment is a standard practice introduced by each export company for which the main objective is to achieve the requirements imposed by the private and government sectors of importing countries.

The success of fruit export of peaches and nectarines from Chile depend on fruit grading quality categories and arrival condition of the fruit in the market. Maturity and quality parameters are characterized at harvest and different grades are standardized during the process of packaging in relation to percentage of red colour and tolerance for defects at each grading size. For example, Class I includes fruit with >70% of red colour; and summation of

defects should not be more than 10%. Russet and skin discolorations are the most frequent damage, but the severity of each one cannot be bigger than 1 cm² for Class I. Other defects, such as split pit, open seam and insect injury (thrips) are included, considering severity and tolerance. In the case of Class II, the tolerance for defects increases, but colour continues as the main requirement of the class.

Differences among markets are produced by packaging materials and quarantine treatment requirements. Chile is considered free of fruit fly, however other quarantine pest (e.g. *Pseudococcus viburni*) force fumigation with methyl bromide or regulation inspections prior to shipment.

Fruit condition in the market is highly dependent on deterioration factors during storage. Fruit shrivelling, decay and internal physiological disorder are recognized by the industry as the critical post-harvest problem claimed by the consumer within this market. Mealiness and internal browning are the main symptoms associated to physiological disorder with a negative change in texture and flavour that cannot be counteracted in considering highly soluble solid concentrations obtained at harvest. Therefore, post-harvest management focuses on sanitation practices and the cooling chain needs to be supplemented with special post-harvest protocol in order to minimize the sensitivity of the variety to physiological disorders from harvest to consumer.

**Fruit Harvest**

Firmness and background colour change are used as harvest indexes for peach and nectarine, values between 12 to 14 lb and background colour changes from green to yellow are well accepted for many varieties. Hard fruit, at maturity stage, allows the processing in a packing line with high tolerance to physical damage. In Chile, the minimum percentage of total soluble solids (TSS) at harvest time is 10 % but 11 to 12 % for the UK market. The Asian markets require low acid content of about 0.5 % (while 0.9-1 % for the European market) and white flesh.

A shorter post-harvest period using air shipping allows harvest at more mature stages (8-10 lb) with better flavour.

**Cooling management**

Cooling management is well recognized as the main post-harvest practice to reduce softening and delay decay expression during storage. The pulp temperature should be -0.5 °C and -1 °C for varieties with TSS higher than 14 %. Temperature management should be in agreement with the time period up to fruit processing.

1. For fruit packed within 24 h before harvest, fruit does not need to cool down to 0 °C; homogenization of the temperature to 15-20 °C by hydrocooling is recommended.

2. For fruit packed after 24 h from harvest, the fruit needs to cool the pulp between 2-4 °C and storage into the cold room at 0 °C until processing. Fruit temperature lower than 3 °C in the centre of the bin needs to be achieved within the first three days of storage. Hydrocooling with sanitized water (with 100 ppm free chlorine) is a recommended cooling method, because of the fast cooling capacity and sanitation in the same operation.

Fruit temperature management affects fruit softening and decay; but also increases the development of internal physiological disorder when fruit is stored at temperature between 3 and 5 °C. Although, 0 °C pulp temperature is required and delays the expression of the disorder, the length in storage at 0 °C produces irreversible damage to the ripening process that ends with the symptoms described as mealiness and internal browning when the fruit is ripened at 20 °C. During the period of storage at 0 °C the enzyme responsible for the degradation of the cell walls and development of the characteristic „juicy“ is inactivated. Consequently, during ripening the pectin of the cell walls is not decomposed, the pectin continues attracting water and binding it. Thus, juiciness is not developed but mealiness. The expression of the defect is at ripening, i.e. at the supermarket or at the consumer level.

The time of induction of physiological disorder at 0 °C is genetically determined, therefore it is useful to classify the varieties according to the induction period, and the commercialization of the variety should be limited to this induction period. The maximum time at 0 °C is set for each variety in order to achieve at least 70 % of juicy fruit. In the table it is described the induction period (days) of physiological disorder of peaches.
and nectarines stored at 0 ºC. The fruit was evaluated at ripening after 4 days at 20 ºC. The incidence of the disorder is less than 30%.

In addition, the concept of holding time in the market or expiring date of the variety is developed.

Having said this, it is clear that the only way to guarantee the eating quality in the market is marketing peaches and nectarines by variety and labelling the name of the variety and labelling the harvest date.

Post-harvest research has been focused to extend the induction period of the varieties.

The result is pre-conditioning practice delaying the fruit cooling at 20 ºC for 24 to 48 h has been successfully introduced commercially and it has increased the time period of fruit at 0 ºC within almost 10 days without the development of internal disorders. Controlled atmosphere has also been demonstrated to reduce the development of internal browning. However, the optimum concentration of gases (15-17% CO₂, 4-7% O₂) has been difficult to achieve commercially.

In addition, the concept of holding time in the market or expiring date of the variety is developed.

<table>
<thead>
<tr>
<th>Varieties</th>
<th>Induction period (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crown Prince</td>
<td>35</td>
</tr>
<tr>
<td>Calhoun Lady</td>
<td>25</td>
</tr>
<tr>
<td>Flavor Crest</td>
<td>30</td>
</tr>
<tr>
<td>June Lady</td>
<td>25</td>
</tr>
<tr>
<td>O'Herry</td>
<td>35</td>
</tr>
<tr>
<td>Rich Lady</td>
<td>45</td>
</tr>
<tr>
<td>Round Red</td>
<td>20</td>
</tr>
<tr>
<td>Flame Crest</td>
<td>25</td>
</tr>
<tr>
<td>September Sun</td>
<td>20</td>
</tr>
<tr>
<td>Summer Lady</td>
<td>25</td>
</tr>
<tr>
<td>Sweet Septenary</td>
<td>25</td>
</tr>
<tr>
<td>Vista</td>
<td>40</td>
</tr>
<tr>
<td>Winter Lady</td>
<td>25</td>
</tr>
</tbody>
</table>

The incidence of the disorder is less than 30%.

Maximum Holding time (days) in the market

<table>
<thead>
<tr>
<th>Varieties</th>
<th>USA</th>
<th>Europe</th>
<th>Taiwan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crown Prince</td>
<td>16</td>
<td>17</td>
<td>11</td>
</tr>
<tr>
<td>Calhoun Lady</td>
<td>25</td>
<td>17</td>
<td>11</td>
</tr>
<tr>
<td>Vida</td>
<td>20</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>Flavor Crest</td>
<td>30</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>Elegant Lady</td>
<td>45</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Pocasado Roy</td>
<td>6</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>O'Herry</td>
<td>6</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Ryan Sun</td>
<td>8</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>September Sun</td>
<td>9</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>Flame Crest</td>
<td>6</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Sumter Lady</td>
<td>6</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>San Juan</td>
<td>6</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Loma Lady</td>
<td>5</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Napa Lady</td>
<td>5</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>SummerApril</td>
<td>5</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Super March</td>
<td>5</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>September Sun</td>
<td>5</td>
<td>8</td>
<td>10</td>
</tr>
</tbody>
</table>

Fruit transport

Fruit is transported to Europe and Asia mainly in reefer (refrigerated) containers, and the use of a refrigerated chamber within vessels is commonly used for the USA. Maintenance of the cold chain, 0 ºC (±0.5 ºC), from the refrigerated warehouse to the market is required to prevent condensation and softening. Reefer containers are mainly loaded at the warehouse and cold chambers of the vessel are loaded in the port with palletized fruit transported by refrigerated truck.

Conclusion

Quality of Chilean peaches and nectarines exported to the international markets is mainly affected by physiological disorders (mealiness.
and internal browning). Restrictions on the commercialization of the varieties considering the period of induction of the disorders at 0°C and post-harvest management that maintain the cool chain from the warehouse to the market are necessary in order to maximize the eating quality for the consumers.

References


1. Varieties grown today and in the future

All cultivars of peaches, nectarines and flat fruits came from *Prunus persica*, belonging to the family of stone fruits. Peaches and nectarines are the same species, even though they are regarded commercially as different fruits. Nectarines are a mutation of common peach, not a crossing between peach and plum, as commonly said.

Common characteristics: Size from 56–61 mm to 80 mm diameter. The flesh is yellow to white, perfumed and juicy. The skin is uniform and intensely coloured covering almost the entire range of red-orange, pink shades and entirely yellow.

Specific characteristics of the nectarine: The skin is smooth, shiny, and free of fur. The flavour passes through a wide range of sweet flavours, with a more intense flavour than the peach.

Specific characteristics of the peach: The skin is smooth and velvety. Some cultivars have entirely yellow skin.

Specific characteristics of the flat fruit: This group is characterized by its very attractive flattened shape and sweet flavour. There are two types: The flat peach is very similar to the peach as its velvety smooth skin and colours. The flat nectarine (known as Platerine) is very similar to the nectarine as its smooth, shiny, free of fuzz, skin and its colours.

Consumers demand variation in their food choices. So, fruit attributes diversifications have been introduced by breeders in their programs. These innovative objectives are: symmetrical and rounded fruits resulting in less damage during harvest and handling and better shelf life, firmness of the flesh (higher demand for crunchier, not melting and less juicy fruits) related with longer shelf life and palatability (consumers demand more sugar and less acidity).

In the past decades a deep varietal transformation has occurred in the sector, so that, in just 15 years, the varietal range has been renewed almost entirely.

New varieties are based in more than 70 existing breeding programs in the world, led by the United States, from where more than the 50% of the new varieties come. In Europe, Italy and France lead the varietal development. In recent years, public and private programs have had a significant increase. Like other producing countries, Spain is heavily dependent on foreign varieties, mainly from the U.S., Italy and France.

The constant irruption of new varieties of sweet and ever greater coloration has been the most remarkable fact of varietal innovation. Nectarine is the group with the greatest dynamism in which breeders have devoted more effort in recent years. The introduction of the variety „Big Top®” and its significant impact on growers, is the most notable event in the latest 15 years, from the point of view of varietal innovation. Unlike other fruits, as pears and apple, consumers can not tell or associate a name of cultivar to this group.

Yellow flesh nectarines: This is the group where varietal innovation has been more important and the one that has increased production in the latest 15 years. New varieties provide fruits with an optimum red coloration, spherical shape, firm flesh and mainly sweet flavour.

White flesh nectarines: In this group varietal innovation has been much lower than in yellow flesh nectarine, but now it also provides several new varieties with good colour, sweet taste, not sensitive to skin cracking, and covering an extended period of maturation.

Flat peaches and nectarines: This is the varietal group that has undergone the most growth in recent years in Spain. Its interest is due mainly to the commercial scale introduction of new varieties of flat peaches with: specific sweet taste, more or less aromatic, greater colouring, better pistil cavity enclosing, greater ability to handling, considerably expanded times of maturation running from late May to late September, more symmetrical flat shape, and flesh colour from white to yellow. This enables their identification by the consumer. That situation is not possible in the case of peaches and nectarines, where similar form (shape and colour) provide very different tastes. The varietal range of flat nectarines is still limited. Its production is small if compared to the flat peaches.
White flesh peaches typically are very sweet with little acidity. In addition, there are varieties with red skin and white flesh.

Yellow flesh peaches typically have an acidic tang coupled with sweetness, though this also varies greatly. Europeans and North Americans have historically favoured the acidic, yellow-fleshed types. Overall, it can be said that yellow flesh varieties have lower palatability than white ones. But now, the market shows new trend towards less acidic and sweeter varieties.

A special group of varieties are those with yellow skin and flesh. These are usually antiques cultivars for internal consumption, harvested during late season. They are in strong regression. In addition, there are varieties with red skin and yellow flesh.

The distribution of varieties in Spain is as follows: 76 % yellow fleshed nectarines and 24 % white fleshed nectarines; 86 % yellow fleshed peaches and 14 % white fleshed peaches.

In order to classify different types of varieties depending on the acidity of the fruit, it has established a classification based on the total acidity of the flesh, because it was the most distinctive attribute to distinguish varieties through their flavour. It was established five groups, ranging from sub-acid to the highly acidic, as shown in table.

Recently, taste is measured taking into account the rate between Soluble Solid Concentration and Acidity.

General trends in actual breeding programs are headed to obtain varieties of: sweeter taste, firm and crunchy flesh, lot of flavour, slow ripening, expanded harvesting schedules, and greater resistance to crop pests, due to the reduction of maximum residue limits MRL and the reduction of authorized active substances.

In order to meet consumer demand and distribution, an actual trend has been to create breeders varietal series covering an extensive calendar of maturation and with similar characteristics with regard to presentation and flavour but with a unique identifying name for each thereof. That is the case of varietal series as Honey® from Zaiger Genetics Inc. (U.S.A.), Nectapom® from Agro Selection Fruits (France), Extreme® from Nursery PROVEDO (Spain), and „UFO“ from CRA-Rome, among others.

Variatel adapting supply to the customer preferences will be the key for the future.

Given the large number of varieties grown in Spain, the different colours of skin and flesh and flavours, it is recommended to consult the following link where detailed information can be found: http://www.ruralcat.net/c/document_library/get_file?uuid=1ae82616-fec3-4ff3-9dd2-8a580bb5c6e4&groupld=10136

2. Peach, Nectarine and Flat peach production in Spain

The world production of about 19 Mio. t is dominated by China (10 Mio. t) followed by the European Union (3.7 Mio. t) and the United States (1.125 Mio. t) (2008/2010, source FAO)

Spanish production ranges as follows: 850,000 to 750,000 t peaches, 540,000 to 430,000 t nectarines and 51,000 t (2008) to 102,000 t (2010) to 120,000 (2012) flat peaches and platerines, strongly increasing. The variability is strictly linked to climatology. The production regions are situated in the Mediterranean arch related with the chilling hours (trees need a winter dormancy to blossom properly).
The European Union production reaches an average (2008–2010, source: Europech’10) of 3.7 Mio. tons per year for all group, and it is distributed as follows: 41 % Italy, 30 % Spain, 20 % Greece, and 9 % France.

Spanish export reaches an average of 490,000 tons per year for all groups, and it is distributed as follows:

### SPANISH EXPORTS

<table>
<thead>
<tr>
<th>DESTINATION</th>
<th>PEACH t</th>
<th>%</th>
<th>NECTARINE t</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>40.000</td>
<td>18</td>
<td>53.000</td>
<td>19</td>
</tr>
<tr>
<td>Germany</td>
<td>36.000</td>
<td>17</td>
<td>52.000</td>
<td>19</td>
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<tr>
<td>Italy</td>
<td>29.000</td>
<td>13</td>
<td>25.000</td>
<td>10</td>
</tr>
<tr>
<td>Portugal</td>
<td>21.000</td>
<td>10</td>
<td>15.000</td>
<td>6</td>
</tr>
<tr>
<td>UK</td>
<td>17.000</td>
<td>8</td>
<td>22.000</td>
<td>8</td>
</tr>
<tr>
<td>Others (*)</td>
<td>77.000</td>
<td>34</td>
<td>103.000</td>
<td>38</td>
</tr>
<tr>
<td>TOTAL</td>
<td>220.000</td>
<td>100</td>
<td>270.000</td>
<td>100</td>
</tr>
</tbody>
</table>

**Exported production**

<table>
<thead>
<tr>
<th></th>
<th>No.</th>
<th>%</th>
<th>Mt.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25%</td>
<td>Mt.</td>
<td>5%</td>
<td>Mt.</td>
</tr>
</tbody>
</table>

**SOURCE:** Eurostat - Average last 5 years

(*) Mainly: Holland, Belgium, Russia, Poland

### 3. Internal and taste quality

Peaches, nectarines and flat fruits are climacteric fruit. They are able to ripen after being harvested. So, they must be harvested at the beginning of pre-climacteric phase.

The most important quality attributes of peaches and nectarines are a delicate balance of sugars, acids, aroma (a mix of volatile compounds) and flesh texture. These characteristics must evolve after fruits have been harvested to reach consumer in their perfect maturity.

Taste is related to soluble solids concentrations (SSC), and titratable acidity (TA). Fruit maturity at the moment of harvest must be 8–10 °Brix (Refractometric Index). Optimum acceptance by consumers is established between 10–11 °Brix. EU standard sets maturity requirements and establishes: „Fruits must be sufficiently developed and display satisfactory ripeness. The minimum refractometric index of the flesh should be greater than or equal to 8 °Brix."

Observing the acidity evolution data, it is seen that the best flavour corresponds to acidity values around 50 to 100 meq/l for yellow peaches. For red ones it is possible to obtain higher values from 120 to 130, and for yellow nectarines from 100 to 150. These data are indicative of the best values of acidity. But it does not imply that fruit, whose acidity value is outside this range, will not always be rejected, since better acceptance is the combination of firmness, acidity, sugar, flavour, etc. For all cases acidity evolves along the season, from very high values to acceptable levels (around 50-80 meq/l for peaches and 100-120 for nectarines).

Regarding the Soluble Solids Concentration to Titratable Acidity ratio (SSC:TA), a general opinion is that the higher the ratio the greater consumer acceptance. However, the same relationship SSC:TA can be achieved with a SSC high or low, but with a lower TA. Thus a low TA can compensate a low SSC for yielding the same SSC:TA. It is suggested that the peach consumer acceptance was more sensitive to the SSC:TA ratio than the SSC, but only within an acceptable range of TA, and depending on the variety.

Aroma is elicited by compounds which exhibit some volatility. Volatiles compounds were classified into 6 chemical classes: terpenes, aldehydes, esters, alcohols, acids and ketones.

Texture or flesh firmness is commonly measured with hand-held penetrometer-type pressure testers [with a 8 mm (= 0.5 cm²) diameter plunger tip (flat probe)] To avoid damage during harvesting, packaging and transport, penetrometer resistance recommendation must be less than or equal to 5 kg of average measure of resistance in the apex and in the equatorial zone. Fruit with flesh firmness between 2,7 to 3,6 kg is considered „ready to buy“, between 0,8 to 1,3 kg is considered „ready to eat“ and of 2,75 kg or less is very susceptible to damage during handling. Fruits should arrive the point of sale before it reaches the state „ready to buy“ to prevent damage to the entire supply chain, including final manipulations to be offered to sale.

EU standard sets out methods to measure the cited parameters in the publication of the OECD Scheme for the Application of International Standards for Fruit and Vegetables entitled “Guidance on objective tests to determine quality of fruits and vegetables and dry and dried produce”.

Growers need to decide the exact moment to harvest their fruits, to assure the correct evolution of the fruit, combining the above mentioned parameters, the proper characteristics of the cultivar, the basic ground colour of the
Quality production of peaches and nectarines in Spain

outer skin and the age of the fruit from full flowering.

4. Defects affecting appearance and shelf life

Caution during harvesting and handling to minimize damage (i.e. punctures, bruising, abrasion) is vital to ensure a high-quality product. Fruit quality, therefore, is determined by a complex mix of environmental, agronomic, genetic, and man-made factors.

Defects affecting appearance: bacterial spot (*Xanthomonas pruni*), scab spots, (*Cladosporium carpophilum*), insects attacks (scales, aphids, silver thrips), hail damage, leaf or branch rubs, split stone, and bruising. Split stone is a defect when causing an unhealed crack in the flesh or when affecting the shape to an extent that the fruit is not well formed. Fruits showing a typical form of an „8“ or fruits with a pointed shape, which is non typical for the variety, indicate the possible presence of a split stone, although not visible from the outside. Focus of fungal contamination in the seed through the stem, which allows entry of rainwater or dew. It is demonstrated that fruit with even the smallest visible split was likely to have mould growing inside, around the seed. It is also noted that they were likely to have a split stone. This type of defect is generally seen in the early season.

Specifically in nectarine and platerine is necessary to mention damages by shrivelling (pronounced shrivelling on the shoulders of the fruit) due to desiccation at dry atmosphere, silvering caused by thrips feeding on the skins surface and cracking. The presence of excessive humidity during ripening causes deep cracked skin.

Post-harvest losses due to pathological disorders are primarily from rapidly spreading fungal pathogens such as grey mould (*Botrytis cinerea*), Rhizopus Rot (*Rhizopus stolonifer*), Brown Rot. *Monilia* (*Monilia fructicola* and *Monilia laxy*), and Alternaria. *Monilia* is the most important post-harvest disease of stone fruits. These diseases spread rapidly when fruit are in contact with other fruit that is in the process of deterioration.

Post-harvest losses due to physiological disorders are mainly caused by inappropriate storage conditions. Internal Breakdown or Chilling Injury is characterized by flesh internal browning, flesh mealiness, usually clearly evident around the stone and often spreads out radially and failure to ripen and flavour loss. Fruit stored for too long periods within the 2.2 to 7.6 °C temperature range are more susceptible to this disorder. Inking (Black Staining) is a cosmetic problem affecting only the skin of peaches and nectarines. It is characterized by black or brown spots or stripes. These symptoms appear generally 24-48 hours after harvest. Inking occurs as a result of abrasion damage in combination with heavy metals (iron, copper and aluminium) contamination. Cotton-wool texture is usually observed only at temperatures from 2 to 4 °C, and is rarely met at 0 °C. It appears during complementary ripening after cold storage. Methods which have been recommended for overcoming woolliness are storage at 0 °C with a preliminary period at higher temperature.

5. Grading and standards


Within the framework of the activities of the scheme for the application of International Standards for Fruit and Vegetables set up by Organization for Economic Co-operation and Development (OECD) explanatory brochures comprising comments and illustrations are published to facilitate the common interpretation of standards. In 2010 the OECD published a specific Explanatory Brochure for Peaches and Nectarines where it is possible to consult pictures of all defects described earlier (http://www.oecd.org/tad/code/oecdfruitandvegetablesstandardsbrochures.htm).

6. Packing

Peaches, nectarines and flats fruits are mainly packaged in the following means loose or layered in single or double layer trays in wooden or carton box of 30 x 50 or 40 x 60 cm with specially shaped plastic insert trays or paper inserts, in baskets, string bags (“Girsac”), punnets, or flow packs.
7. Storage conditions

Fruit selection and packaging facilities need to run at high capacity over the entire duration of the harvest season in order to maximize financial return. To ensure a uniform supply of fresh product for such delivery, the selection and packaging plants utilize fruit from different locations and, when necessary, from cold storage. However, post-harvest storage is generally too expensive to be used routinely, and only a few varieties show appropriate behaviour for cold storage due to the highly perishable nature of majority of these fruits.

Considering the facts that fruits are living material and may vary considerably and there are such a wide range of cultivar and different roles played by horticultural factors, it is too difficult to establish general recommendations for determining the correct moment to harvest, pre-cooling conditions, cold storage, shipping, and shelf life even for the same cultivar in all climates.

Pre-cooling: For most varieties, fruit must be pre-cooled as soon as possible because they are harvested frequently in days with high ambient temperatures, and also to avoid weight loss and waste during storage, to stop biological activity and to slow the enzymatic softening processes. As a general rule, pre-cooling must be performed under the following conditions: internal temperature must be reduced to 10 °C close to the stone in less than 3 hours; optimum relative humidity during pre-cooling must be between 90-95 % and an air renewal rate of 85 m³/h.

Cold storage: In this field, every variety has its special requirements but experimental results show that due to such a short life of these fruits, cold storage is not widely used. It is only applicable to a bunch of tested cultivars, mainly during mid and late season.

Fruit firmness tends to decrease both during cold storage and subsequent shelf life at 20 °C. However, some nectarine varieties like Big Top® and Honey Blaze® preserve better their firmness for up to 20 and 40 days in cold storage and generally a better consumer acceptance may be expected at 0 °C up to 2 to 6 weeks. Storage should not be prolonged beyond limits compatible with the maintenance of good quality.

Temperatures of -1 to 2 °C, subject to exception, have been recommended. A period of 2 to 5 days at a higher temperature, before the fruit is put into the cold, may avoid the development of a cotton-wool texture (mealiness) in certain varieties which are susceptible to this disorder, for example 2 to 3 days at 24 °C for some varieties. Freezing point varies depending on SSC from -3 to -2.5 °C. Because internal breakdown is the main limitation to market life, minimum post-harvest life occurs when fruit is stored at 5 °C.

The optimum relative humidity for the storage of peaches is 90-95 %.

In certain cases, complementary ripening may be needed at the end of the period in the cold store. Good results have been obtained with ripening temperatures of 18 to 20 °C. If cold storage has been too prolonged, the fruit is, in many cases, no longer capable of ripening normally.

In general terms, peaches and nectarines harvested at specific moment will ripen properly without exogenous ethylene application. Ethylene application to fruit harvested near to maturity will only ripen the fruit more uniformly without speeding up the rate of ripening. A few cultivars may need to be exposed to ethylene to ripen properly.

Controlled Atmosphere (CA): In this field, every variety has its special requirements. Experimental results show that due to such a short life of these fruits controlled atmosphere storage is not widely used. As for the influence of controlled atmospheres and shelf life on the sensory attributes of peaches and nectarines, the results of numerous tests showed that the storage length was the most prominent factor in the perception of flavour by the consumer, with
longer periods resulting in fruits less appreciated by the consumers.

It may also be noted that too long storage at a temperature which is usually tolerated, may hinder the development of aroma and may favour the appearance of a reddish coloration in the flesh, or the disorders previously described.

Maximum useful market life, pending of each cultivar, is between 1 to 7 weeks for nectarines, and 1 to 5 weeks for peaches.

Shipping conditions: As general guidelines could be mentioned temperature of 2 to 4 °C, 85 to 95% relative humidity and 0.25 m/sec air speed to avoid desiccation and weight loss.

8. Shelf life

Fruits must arrive to the point of sale before reaching „ready to buy“ firmness to prevent physical damage during handling and distribution before it is put on sale. Firmness decreases slowly since the beginning of the ripening, to subsequently suffer a faster loss.

At the point of sale, the fruit should mature, developing its flavour and softening.

At the point of sale, the average evolution data for firmness are: 0.9 to 1.1 kg/day at 20 °C and 1.1 – 1.7 kg/day at 25 °C.

From over a thousand of different peach and nectarine cultivars are grown in Spain. Post-harvest life varies widely in each cultivar, and is strongly affected by temperature management during these operations. Longest useful shelf-life life can be reached if fruit is stored at 0 °C, but shorter at 5 °C.

9. Quality assurance measures

Most of Spanish fruits exporting companies have wide experience sending their products to high requirement markets (EU, U.S.A., Canada, Japan, etc). In these markets the fruit distribution is controlled by large supermarket chains which agree seasonal supply contracts throughout the campaign with Spanish companies. Since some time ago these chains have required their suppliers to implement and certificate their systems of quality assurance. More recently these certifications have been extended to environmental and labour safety.

The majority of Spanish exporters possess certifications such as:

GLOBALGAP is a standard at operational level that covers the whole production process of the certified product, from the first moment (e.g. control points for nursery plants) and all subsequent farming activities until the product leaves the production unit. Today, GLOBALGAP is the world’s leading farm assurance program, translating consumer requirements into Good Agricultural Practice in a rapidly growing list of countries – currently more than 100 on every continent. For consumers and distributors, the GLOBALGAP certificate is a guarantee that foodstuffs comply with established quality and safety standards, and have been produced following criteria of sustainability, respecting the safety, hygiene and well-being of workers, the environment, and taking into account respect for animals.

INTERNATIONAL FOOD STANDARD (IFS FOOD): The IFS Standard is a model requiring the prior acceptance of produce suppliers for distributors and shopping centers of France and Germany. This is a private technical protocol developed by German, French and Italian distributors intended to help suppliers to supply safe products in accordance with specifications and current legislation. This protocol requires the previous implementation of a quality management system, and HACCP system (Hazard Analysis and Critical Control Points).

BRITISH RETAIL CONSORTIUM (BRC Standard): The BRC Standard for food has as its objective to ensure that suppliers comply with a series of requisites which guarantee the salubriousness of the food. This is one of the most widely accepted models internationally, so that distributors and department stores can qualify their own brand product suppliers.

ISO 9.001:2008: This International Standard promotes the adoption of a process approach when developing, implementing and improving the effectiveness of a quality management system, to enhance customer satisfaction by meeting customer requirements.

NATURE’S CHOICE – TESCO (UK)

SUPPLIER ETHICAL DATA EXCHANGE (SEDEX) is a non-profit membership organization dedicated to driving improvements in
responsible and ethical business practices in global supply chains.

BUSINESS SOCIAL COMPLIANCE INITIATIVE (BSCI) is a leading business-driven initiative for companies committed to improving working conditions in the global supply chain.

Other quality management systems like TRACEABILITY requirements and INTEGRATED PRODUCTION had been implemented. Fruit can be traced and tracked from the moment that it is picked in the orchard until it reaches final consumer.
EU marketing standard for peaches and nectarines

Heinrich Stevens

<table>
<thead>
<tr>
<th>Weltproduktion / world production (FAO) in t (2011)</th>
<th>21,528,690 t</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hauptanbauländer / Main producing countries</strong></td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>11,528,801</td>
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<tr>
<td>Italien / Italy</td>
<td>1,636,750</td>
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<tr>
<td>Spanien / Spain</td>
<td>1,335,600</td>
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<tr>
<td>U S A</td>
<td>1,171,450</td>
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<tr>
<td>Griechenland / Greece</td>
<td>690,200</td>
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<td>Türkei / Turkey</td>
<td>545,902</td>
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<tr>
<td>Iran</td>
<td>498,346</td>
</tr>
<tr>
<td>Ägypten / Egypt</td>
<td>332,487</td>
</tr>
<tr>
<td>Deutschland / Germany</td>
<td>862</td>
</tr>
</tbody>
</table>

Begriffsbestimmung

Definition of Produce

- Pfirsiche / Peaches
  Prunus persica Sieb. et Zucc.
- Nectacot
  – nicht normpflichtig
- Nectacot
  – not covered by the standard

Weltproduktion / world production

(FAO) in t (2011)

Hauptanbauländer / Main producing countries

China
Italien / Italy
Spanien / Spain
U S A
Griechenland / Greece
Türkei / Turkey
Iran
Ägypten / Egypt
Deutschland / Germany
**EU marketing standard for peaches and nectarines**

- **Mindesteigenschaft** (Minimum requirement)
  - **nicht ganz** (not intact)
  - **nicht gesund** (not sound)
  - **gesund** (sound)

These images illustrate the minimum requirements for peaches and nectarines, focusing on visual and internal condition standards.
Mindesteigenschaft

not sound

Mindesteigenschaft

not clean

Mindesteigenschaft

not free from pests

Mindesteigenschaft

not free from damage caused by pests affecting the flesh

Reifeanforderungen

Maturity requirements

The fruit must be sufficiently developed and display satisfactory ripeness. The minimum refractometric index of the flesh should be equal to or greater than 8 Brix.
Reifeanforderungen  Maturity requirements

Reifeanforderungen  Maturity requirements

Klasse Extra  „Extra“ Class

Mindesteigenschaft  Minimum requirement

Mindesteigenschaft  Minimum requirement

Für alle Klassen  For all classes

Klassen „Extra“ & I  Classes “Extra” & I

Klasse I  Class I

© BLE, IAT - 2013
## EU marketing standard for peaches and nectarines

### Klasse I

- **Klasse I**
  - leichte Druckstellen <= 1 cm² Gesamtfläche
  - slight bruises <= 1 cm² of total surface area

- **Klasse I**
  - längliche Hautfehler bis zu 1,5 cm Länge
  - skin defects <=1.5 cm in length for defects of elongated shape

- **Klasse I**
  - sonstige Schalenfehler bis zu einer Gesamtfläche von 1 cm²
  - 1 cm² in total surface area for other skin defects

- **Klasse I**
  - leichte Hautfehler (Rissigkeit in der Fruchtnaht)
  - slight skin defect (rough seam)

### Klasse II

- **Klasse II**
  - Das Fruchtfleisch frei von größeren Mängeln
  - The flesh free from major defects

- **Klasse II**
  - Fruchtfleisch nicht frei von größeren Mängeln
  - The flesh not free from major defects

- **Klasse II**
  - Formfehler
  - Defect in shape

- **Klasse II**
  - starker Formfehler
  - severe defect in shape
EU marketing standard for peaches and nectarines

Klasse II

Entwicklungsfehler – am Stielansatz offene Frucht nicht zulässig
Defect in development – open fruits not allowed

Klasse II

leicht verfärbte Druckstellen <= 2 cm² Gesamtfläche
slightly discoloured bruises <= 2 cm² in total surface area

Klasse II

Entwicklungsfehler – offene Steine, Fruchtfleisch gesund
Defect in development – split stone, flesh is sound

Klasse II

längliche Hautfehler bis zu 2,5 cm Länge
skin defects <=2.5 cm in length for defects of elongated shape

Ausschluss

Entwicklungsfehler – am Stielansatz offene Frucht nicht zulässig
Defect in development – open fruits not allowed

Ausschluss

sonstige Schalenfehler bis zu einer Gesamtfläche von 2 cm²
2 cm² in total surface area for other skin defects

Ausschluss

Entwicklungsfehler – offene Steine, Fruchtfleisch gesund
Defect in development – split stone, flesh is sound

Klasse II

Hautfehler (Rissigkeit in der Fruchtnaht)
skin defect (rough seam)
starker Hautfehler (Rissigkeit in der Fruchtnaht) = nicht ganz
severe skin defect (rough seam) = not intact

Die Größe wird nach dem größten Querdurchmesser, dem Gewicht oder der Anzahl bestimmt.

Die Mindestgröße beträgt:
- 56 mm oder 85 g in der Klasse „Extra“,
- 51 mm oder 65 g in den Klassen I und II.

Für Klasse II ist die Anwendung der folgenden Bestimmungen wahlweise.

Size is determined either by the maximum diameter of the equatorial section, by weight, or by count.

The minimum size shall be:
- 56 mm or 85 g in Class “Extra”
- 51 mm or 65 g in Classes I and II.

The following provisions are optional for Class II.

“Extra” Class
- 5 % conforming to Class I
- of which not more than 0,5 % satisfying requirements of class II

Class I
- 10 % conforming to Class II
- maximum of 1 % decay

Class II
- 10 % not satisfying the minimum requirements
- maximum of 2 % decay

Obligatorisch
- Packer / Absender
- Erzeugnis, wenn von außen nicht sichtbar
- Fruchtfleischfarbe
- Ursprungsland
- Klasse
- Größe (Klassen Extra und I)
  a) Mindest- u. Höchstdurchmesser (mm)
  b) Mindest- u. Höchstgewicht (g)
  c) Größencode

obligatory
- Packer / Dispatcher
- Produce if not visible from the outside
- Colour of the flesh
- Country of origin
- Class
- Size (Classes „Extra“ und I)
  a) min. & max. diameters (mm)
  b) minimum and maximum weight (g)
  c) size code
 Kennzeichnung                                    Marking

Vielen Dank!
Many Thanks!
Inspection Experience in 2012 – in Germany

Franz Egerer

The structure of inspection services: Some of the Federal States offer a semi-private voluntary inspection, i.e. an inspection on demand, carried out by the agricultural chambers or, in Bavaria, by the Landeskuratorium Pflanzenproduktion (LKP).

Official quality inspection is assured by the German federal government and by the individual federal states. In this context, the BLE is competent for inspections of both imports from third countries and re-exports (produce from other member states or imported produce). The individual federal states are competent for inspections on the domestic market, i.e. at dispatch, wholesale, retail levels. In some federal states, however, inspections at retail level are not carried out by a governmental inspection service but by the municipal and district food inspection services competent for the retail level.

The BLE is the co-ordinating authority pursuant to Reg. (EU) No. 543/2011.

Performance of conformity checks: Conformity checks are carried out selectively and based on a risk analysis. The inspection services of the Federal States operate a single database (DVQK) to save their inspection results and to evaluate them for their risk analyses. The checks are documented and statistically evaluated. Produce with defects that are rejected at the wholesale level, and which could have been detected at dispatch, is notified to the member state of origin via the BLE. Similarly, the BLE notifies, to the EU commission and the country of origin, produce with defects assessed at the import stage. The databases are evaluated for the annual inspection report requested by the EU Commission. In addition, the German inspection services (i.e. inspectors) inform each other regularly about their experiences during daily inspection.

Statistics of inspection in 2012

Producers: In Bavaria, producers are checked by the voluntary inspection service LKP. It inspected 153,846 t of vegetables and 3 t of fruits destined for processing as well as 12 t of vegetables and 5 t of fruits for the fresh market.

Wholesale and retail: In Bavaria, both wholesalers and retailers are checked by the Landesanstalt für Landwirtschaft, the competent authority at the federal state level.

Non-conformities by supplier countries:

<table>
<thead>
<tr>
<th>Herkunft / origin</th>
<th>Kontrollen / inspections</th>
<th>Mengen / quantity (kg)</th>
<th>Ware / Conform ( % )</th>
<th>Verwarnung / verbal / warning ( % )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Österreich / Austria</td>
<td>22</td>
<td>22</td>
<td>0</td>
<td>22</td>
</tr>
<tr>
<td>Marokko / Morocco</td>
<td>9</td>
<td>21</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Israel / Israel</td>
<td>11</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Chile / Chile</td>
<td>20</td>
<td>20</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Deutschland / Germany</td>
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<td>240,792,64</td>
<td>63,47</td>
<td>0</td>
</tr>
<tr>
<td>Frankreich / France</td>
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<td>20</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Griechenland / Greece</td>
<td>10</td>
<td>10</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Niederlande / Netherlands</td>
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<td>0</td>
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<tr>
<td>Spanien / Spain</td>
<td>120</td>
<td>256,669,65</td>
<td>25,25</td>
<td>25,25</td>
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<tr>
<td>Belgien / Belgium</td>
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<tr>
<td>Konsument / consumer</td>
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<td>240,862,05</td>
<td>63,47</td>
<td>0</td>
</tr>
<tr>
<td>Weitere Betriebe / other businesses</td>
<td>10</td>
<td>10</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Insgesamt / total</td>
<td>225</td>
<td>270,554,69</td>
<td>63,47</td>
<td>0</td>
</tr>
</tbody>
</table>

Non-conformities by produce:

<table>
<thead>
<tr>
<th>Art / species</th>
<th>Kontrollen / inspections</th>
<th>Mengen / quantity (kg)</th>
<th>Ware / Conform ( % )</th>
<th>Verwarnung / verbal / warning ( % )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tomaten / tomatoes</td>
<td>20</td>
<td>77,406,02</td>
<td>15,00</td>
<td>15,00</td>
</tr>
<tr>
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<td>81</td>
<td>153,531,00</td>
<td>56,91</td>
<td>27,88</td>
</tr>
<tr>
<td>Bohnen / beans</td>
<td>77</td>
<td>123,763,10</td>
<td>25,25</td>
<td>10,00</td>
</tr>
<tr>
<td>Zitronen / lemons</td>
<td>20</td>
<td>5776,00</td>
<td>100,00</td>
<td></td>
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<tr>
<td>Pflaumen / plums</td>
<td>20</td>
<td>5776,00</td>
<td>100,00</td>
<td></td>
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<tr>
<td>Salat / salads</td>
<td>50</td>
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<td>87,50</td>
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<tr>
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<td>85,71</td>
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<tr>
<td>Eier / eggs</td>
<td>20</td>
<td>77,406,02</td>
<td>15,00</td>
<td>15,00</td>
</tr>
</tbody>
</table>

Quality assurance: Over the past years, food retail trade and production in Germany did experience a strong concentration process. Subsequently, staff was heavily reduced both in the voluntary
and the governmental inspection services.

Simultaneously, many governmental marketing standards were withdrawn and a general marketing standard was introduced which contained only minimum requirements and the provision regarding labelling the country of origin. In Germany, intentions are to also suspend the existing specific standards. On the German market, the UNECE standards did experience a triumphant victory. Based on the (EU and UNECE) marketing standards, company-specific requirements are being drafted which focus mainly on accepted residues and desired qualities.

Inhomogeneous extent of inspection (General Marketing Standard, UNECE standard)

Trade did develop inspection systems of their own to carry out checks when goods are received and/or dispatched.

On the one hand, governmental inspection services increasingly function as moderators between production and trade, i.e. they explain the uniform application of the marketing standards and the inspection method and offer training sessions. On the other hand, the necessity of governmental inspection to check compliance with marketing standards for fruit and vegetables is questioned. Private certification systems progressively take over quality assurance which is the conditio sine qua non for market access.

Interestingly enough, politics and the media make marketing standards the scapegoat of our throwaway society.
**Inspection Experiences in 2012 in the UK**

*Ian Hewett*

**Green bananas**

- UK Government updated legislation in May to enforce EU Regulation 1333/2011.
- Traders notified of formal introduction of import procedures.
- Importers needed to notify RPA via Peach from 1 August.
- Risk based inspection process introduced from 1 August.
- 415,061 tonnes have been risk assessed.
- 18,184 Tonnes have been inspected.
- 2,433 Tonnes have been found not in conformity.
- 19 Traders have been approved as Exempted Banana Traders.

**Poor weather**

- Drought, floods and a cool summer have led to many issues of low yields and poor quality.
- Higher prices.
- Lower quality available in supermarkets.
- Supermarket consumer education required to explain.
- Marketing standards flexible enough to allow produce to be marketed.

**UK Harmonisation Meeting**

- Held Slaugham, 12 to 14 June.
- 38 delegates from 22 countries attended.
- Practical sessions covering:
  - Citrus, table grapes, sweet peppers and peaches and nectarines
  - General marketing standard for root and leafy vegetables, fleshy and stone fruit, and alliums, peas and beans.

**GMS Interpretations**

- UK developed a set of interpretations for the introduction of GMS.
- Considerable variation in interpretation seen at UK Harmonisation meeting.
- Developed a common set of interpretations in association Netherlands.
- Agreed a harmonised approach between Netherlands and UK in December.

**Prosecutions**

- 5 in total for year – final sanction
  - 2 Retailer – total fine £7,600,
  - 1 Wholesaler – fine £500
  - 1 Distributor – fine £2,700
  - 1 Import Agent - fine £5,500
The Etablissement Autonome de Contrôle et de Coordination des Exportations (EACCE) is the Moroccan Food Exports Control and Coordination Organisation. It is a public organisation created in 1986 and under the supervision of the Ministry of Agriculture and Fisheries. It is endowed with legal personality and financial autonomy. The EACCE is dedicated to food export control. The export control is carried out to make Morocco a trustworthy country of origin, to support and enhance the sector’s competitiveness, and to make the quality of exported products a shared responsibility.

The inspection is carried out on the basis of risk analysis. The packers and exporters are classified in accordance with this risk analysis. We give more importance to the exporters with good historical situation in terms of compliance with the standards. In general, all exporters should know quite well the standards of the destination markets (Europe, USA, Russia etc.).

Since 2002, the EACCE has been approved by the EU for quality controls of fresh fruit and vegetables.

In 2012, Morocco produced about 10 Mio. tons of fruit and vegetables of which roughly 15 % of 1.5 Mio. tons have been exported. 33,500 tons or 3 % of the exports have been rejected because of non-compliance. The main products exported from Morocco are citrus fruit and tomatoes. By the way, tomatoes represent 50 % of the vegetable exports.

We noticed some difficulties with strawberries, specifically on the UK market. We received several notifications of non-conformities from there. One new investor didn’t know the EU marketing standards too well. Thus, we had to stop a certain quantity of strawberries at export stage. Again with strawberries we noticed that we had some problems that were only visible at arrival, e.g. botrytis.

Due to cold weather we did experience Alternaria rot and internal drying in citrus fruit. Unfortunately, those defects become visible only after transit and at arrival in the destination markets (EU and especially Russia).

Citrus fruit: 3,000 tons or less than 1 % of exports had to be stopped because of bruises, collapse of cells, physical damage, defects in colouring, internal drying, defects in sizing, defects in presentation, decay, Alternaria rot, and presence of seeds in easy peelers.

Tomatoes: 30,000 tons or 3 % of the exports have been refuse because of physical damage, defects in colouring, defects in size, excess of maturity, too soft fruit, decay, and problems with labelling (country of origin). Some exporters have been asked by their clients not to label the country of origin. We do our best not to support this.

Strawberries: 90 tons were rejected mainly due to defects in shape, green patches, white shoulders, botrytis, excess of maturity, decay, and bad labelling (especially from Spanish investors).

Melons: 100 tons had to be rejected because of excess of ripening, insufficient maturity, undersize, and sunburns.

Table grapes: 23 tons were refused because of bad labelling.

Peaches and nectarines were not in conformity because of skin defects and undersize.

Other vegetables: 240 tons were rejected because of physical damage, bad labelling, defects in sizing, decay, and defects in colouring.
Let me briefly outline how the inspection of fruit and vegetables in Spain is organized and structured, in order to comply with the provisions of Regulation (EC) No 1234/2007.

The single competent authority responsible for coordination, the „coordinating authority“ as specified in Regulation (EU) No 543/2011, is SOIVRE, the Official Service for Inspection, Verification and Regulation of Foreign Trade. This Service depends from the State Secretariat for Trade, under the umbrella of the Ministry of Economy and Competitiveness.

SOIVRE is formed by a network of 33 offices and 13 laboratories spread through all the country geography, especially close to production areas and ports. Also, it is necessary to mention that there are several inspectors attached to the Spanish Commercial Offices abroad, to a close tracing of our exports.

SOIVRE is the responsible competent authority:

- to coordinate the „inspection bodies“ described in the Regulation.
- to keep up a database on traders in fruit and vegetables. This database lists traders involved in the marketing of fruit and vegetables for which standards have been laid down, and ensures that conformity checks are carried out selectively, based on a risk analysis developed by SOIVRE, and with appropriate frequency, so as to ensure compliance with the marketing standards.
- to inspect exports outside and imports inside the EU. Last year SOIVRE inspected 13,500 shipments of peaches and nectarines outside the EU and 400 imports shipments.
- to transmit to the inspection bodies the nonconformity acts (records) and to gather information from traders about the reasons related with those problems.

The risk analysis is based on an initial level of risk assigned to every trader, based on its position in the marketing chain, the estimated effectiveness their self-checking systems and the commercialised volumes. Later on, the frequency of checks is modulated taking into account the results from previous checks, specific situations which may affect one or more products and/or specific markets, or situations that only affect an individual trader.

Six risk levels have been established (minimum, greatly reduced, reduced, medium, high and maximum), to which correspond minimum initial frequencies of conformity checks.

Traders are classified into three groups, based on the data provided by themselves or those that have been estimated by the inspection bodies; taking into account their annual tonnage of marketed products.

1st Group (higher level of risk): Traders with estimated marketing capacity higher than 25,000 t/year; 5 % in number.

2nd Group (medium level of risk): Traders with estimated marketing capacity between 3,000 and 25,000 t/year; 41 % in number.

3rd Group (lower level of risk): Traders with estimated marketing capacity under 3,000 t/year; 54 % in number.

As is established in the Article 12, Spain has authorised traders classified in the lowest risk category and providing special guarantees on conformity to marketing standards to use the specimen described in Annex II in the labelling of each package at the stage of dispatch.

Traders benefiting from this possibility have:

- an inspection staff who has received approved training;
- a suitable equipment for preparing and packing produce;
- a commitment to carry out conformity checks on the goods they dispatch, and
- a register recording all checks carried out.

In recent years, Spain has exported outside the EU and dispatched to European Union Member States an average of 9.5 million t. per year of fruits and vegetables. Also, our country has imported 2.5 million t. per year. This means...
that it must be controlled about 40,000 tons per working day, equivalent to 2,000 trucks or containers. A complex task to perform without a:

- flexible risk analysis,
- focusing on traders involved mainly in packaging, which are subjected to a higher rate of checks, and finally,
- close coordination with the regional inspection bodies.

It should be borne in mind that the database includes nearly 2,400 traders, mainly packers (86%).

The Kingdom of Spain is composed by 17 Autonomous Regions (or Communities). Each of them is responsible for the implementation of the Regulation (EC) N° 1234/2007 in origin (processing and packaging plants), during the storage, transportation and when offering for sale, within the territory of their jurisdiction. Consequently, SOIVRE must coordinate 17 inspection bodies. This is a difficult task; due to Governments of the Spanish Autonomous Regions have political autonomy and consequently different approaches. So, SOIVRE has a wide range of cooperation degrees in its task and in the interchange of information.

SOIVRE maintains the competence to control the application of risk analysis, although it is exerted mainly by the autonomous regions. With some of them, responsible of the main production of fruit for export, SOIVRE has reached agreements for a closer cooperation.

Control at packaging plant and retailer levels is performed by regional inspection bodies, mainly assigned to the health and consumption departments of the Governments of the Autonomous Regions and by the Health inspection bodies of the City Councils.

The applications of sanctions at national level in relation to irregularities committed in respect of requirements set out in the Regulation (EC) N° 1234/2007 are performed by the inspection bodies. SOIVRE has no competence to apply sanctions.

I mentioned in my previous lecture, that the Spanish exporters and inspection bodies of the Autonomous Communities are conscious of the relevance of quality in fruits and vegetables exports and as proof of this is the small number of claims on destination: Only one record of non-compliance for peaches and nectarines in 2012 from Germany.

As it is known, Spain suffers since some years a severe economic crisis. This situation affects all structures of the society, including governmental agencies of the State and the Autonomous Communities. The main effect to the coordinating authority and inspection bodies is the reduction of their budgets, because there are other priority areas of assistance to the society. These budget reductions are reflected in a shortening of human and material resources to exercise their competences. It must be taken into account that conformity checks of fresh fruit and vegetables are not the only task that Spanish inspection bodies in charge are responsible for.

The positive aspect of the economic crisis is manifested by exporting companies who are fully aware of the necessity to export high quality fruit and vegetables to fuel the Spanish economy and to avoid the demand reduction in the Spanish market.
Reason for an interpretation document

In 2007, the EU published Regulation (EC) No 1234. This regulation is the basis for marketing standards for fruit and vegetables. These have been specified by the Regulation (EC) No 1580/2007 followed by the Regulation (EU) No 543/2011 as 10 specific marketing standards (SMS), thus these marketing standards were reduced from 36 to 10. In addition, a general marketing standard (GMS) was introduced for all other fruit and vegetables. The new GMS covers far more products compared to the previous 36 SMS. Thus, the inspection services and the traders had no experience on application of standards for these new products. Furthermore, the GMS is not very clear about the defects of all those products.

The GMS only contains four chapters:

1. Minimum QUALITY requirements
2. Minimum MATURITY requirements
3. Tolerances
4. Marking of origin of produce

The provisions in these chapters are very general and especially the sections 1 and 2 raise many questions.

The chapter MINIMUM QUALITY REQUIREMENTS only requires a produce to be intact, sound, clean, practically free from pests and damage caused by pests. The question arises what the purpose of these general descriptions is?

For example: Is a cherry with a small healed crack no longer intact? Is a melon with cracks in the area of the peduncle, which is a sign that this type of melon is ripe, ready to eat or is this melon "not intact"? Figues with a white powdery bloom and unwashed carrots with some attached soil – are they "clean"?

In the chapter MINIMUM MATURITY REQUIREMENTS it says that the products must be sufficiently developed and should not be overdeveloped or overripe. And: the development and state of the produce must enable it to reach a satisfactory ripeness. What does this requirement mean and is this for each product the same? No, certainly not! Is it possible in the case of melons to set a minimum Brix value, as in the past or in the previous standard? Is Witloof chicory with a flower stem in the top and almost without any leaves still ok? Are onions with externally visible shoots allowed or overdeveloped? Must all cherries be accepted or is there a limit to not sufficiently developed and ripe?
The RPA and also the BLE and AKQ in Germany organise harmonisation meetings in alternating years. In all these meetings and when discussing the GMS and its application, participants leave the meetings with a lot of open questions. In addition it was said at these meetings that it would be of great help to have some kind of an interpretation document. Such an interpretation document is not only needed for the inspectors of the inspection services, but also for producers and traders. They need to know how to prepare a product or with which specifications it can be traded.

So, it is crystal clear that there was a need for some kind of an interpretation document. And KCB took the initiative to prepare such a document.

Development process

KCB invited the neighbouring countries to inventory if they had the same idea and or if they had already some kind of document. There were ideas and material available and the KCB started to process the ideas and data.

At first, KCB analysed for which products an interpretation was most urgent. It was obvious that those products should be organised in product groups. Sometimes you may have the impression that the products are not all fitting in the same group, but we thought that the number of groups should be reduced to the necessary and to keep the interpretation document as simple as possible. It is important to mention that this draft interpretation document is complementing the GMS – it does not replace it!

What does it look like?

The RPA did develop a very good table for their interpretation document and we decided to implement this table as this table is easy to use and to understand. Moreover, inspectors can find the valuable product specific information on one page.

<table>
<thead>
<tr>
<th>Minimum requirement</th>
<th>The limit of defect allowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intact</td>
<td></td>
</tr>
<tr>
<td>Sound, disease, deterioration</td>
<td></td>
</tr>
<tr>
<td>Clean</td>
<td></td>
</tr>
<tr>
<td>Pests</td>
<td></td>
</tr>
<tr>
<td>Development, ripeness and maturity</td>
<td></td>
</tr>
</tbody>
</table>

At the moment the document is dedicated to ten product groups:

- Cabbage vegetables
- Fleshy fruit & vegetables
- Mushrooms
- Nuts
- Root and Tuberous vegetables (example for the existing, non-exhaustive list of species: Beetroots, carrots, celeriac, fennels, garlic, horse radish, kohlrabies, mooli (daikon-radishes), onions, parsley roots, parsnips, radishes, scorzonera, shallots, turnips, and other such root and tuberous vegetables)
• Stalk and Leafy vegetables

• Citrus fruit (not having a Specific Marketing Standard)

• Tropical fruit

• Pome and Stone fruit (not having a Specific Marketing Standard)

• Soft fruit.

For each group the table was filled with text, which was already available by RPA and KCB documents. Thus, the result was a shared document. In the table for root and tuberous vegetables and with respect to “intact” the following provisions were included:

• Products cleanly halved or portioned are excluded from the General Marketing Standard.

• Healed cracks not reaching into the heart are allowed.

• Carrots: Cracks due to handling or washing, not reaching the heart are admitted. Broken carrots allowed, provided they only have one broken surface. Fractured pieces are excluded. Broken carrots are allowed up to 10 %. (The UNECE standard allows up to 25 % broken carrots.)

• Fennels: Healed damage, provided they do not exceed 3 cm in length.

• Garlic: Tears in the outer skins; missing parts up to 3 cloves are allowed.

• Onions: On one third of the surface the dried skin may be missing.

• Radishes: Cracked bulbs are admitted up to 15 % by weight or number. Leaves may be slight by damaged.

“The produce must not have any damage or injury spoiling its integrity. The following defects are allowed, provided the edibility and keeping quality is not affected:

• a product specific preparation or trimming

• hollow stems or hollowness provided the surrounding flesh is sound, fresh and not discoloured

• slight dry damage and cracks that disappear by normal peeling

• missing peduncle/calyx provided the adjacent flesh is not damaged.”

This document is a more general approach and will be integrated to our document as it makes even more complete.

Status of the document

The status of the document is that most of the work has been done. We did achieve already a high degree of consensus on the text. The last amendments – based on comments from Germany, Belgium and France – are going to be integrated and we are working on a general approval of this interpretation document by all partners.

The very last step could be to include photos illustrating the text – but this is not strictly necessary, in our view.

For the time being, we want to present this interpretation document to all countries that have not been involved yet. We are interested in their comments and whether they consider this document to be a useful one. Finally, this interpretation document should be public and available for everyone.

This document was presented to Germany and France. They were asked for comments, which they kindly send to us.

The BLE in Germany send their GMS interpretation document, which they had developed in co-operation with the federal states. With respect to the minimum quality requirement “intact” the explanatory note reads as follows:
The OECD SCHEME FOR THE APPLICATION OF INTERNATIONAL STANDARDS FOR FRUIT AND VEGETABLES is well known for its explanatory brochures, its guideline on objective methods and its colour gauges for e.g. tomatoes and cauliflower. A little less known is –perhaps– that the control methods set out in annex V of Reg. (EU) No 543/2011 have been developed by the OECD Scheme.

Since 2007 the OECD Scheme is revising the provisions on sampling. When the existing provisions were developed, the presentation in sales packages was of no importance and onions have not been packed in big bags. The Scheme initiated in parallel to the revisions of the provisions on sampling a guideline on inspection. In summer 2013 the approval of the revised provisions on sampling are expected, while the guideline should be approved in December 2013.

The guideline is based on

Annex II of the COUNCIL DECISION REVISING THE OECD SCHEME FOR THE APPLICATION OF INTERNATIONAL STANDARDS FOR FRUIT AND VEGETABLES C (2006) 95 – which is the inspection method including the (revised) provisions on sampling;


Proposals of the OECD Scheme or better to say its member countries. Today, the OECD Scheme has 25 members. Germany is the rapporteur for the guideline.

Here, the draft guideline is presented in excerpts. It is structured as follows:

Operating rules for conformity checks

In this part, it is explained that the purpose of conformity checks is to ascertain that the quality of the produce is in conformity with the relevant marketing standards. When carrying out an inspection, the sampling must be restricted to the absolute minimum whenever a produce fails to meet the requirements of a standard. Authorised (or governmental) control services should follow this method and may issue a certificate attesting the conformity of the lot or consignment with the relevant standard.

Methods of conformity checks

Definitions
The definition concerning risk analysis is new.

Implementation of a conformity check

The proposal to amend the provisions on sampling is new. Packages above 3 kg net weight must no longer be emptied and assessed totally. It is sufficient to take at random a secondary sample of 3 kg from each primary sample. This sample is assessed. The result of all secondary samples (i.e. the composite sample) is representative for the lot.

The implementation of a conformity check is illustrated by examples. For different produce, types of packages and defects, the implementation of a conformity check is outlined by means of explanatory notes and photos and step by step from sampling to assessing the quality or defects and documentation of the inspection result. Finally it is explained whether and how a trader may bring the lot in conformity.

Here, the new sampling is presented on the example of table grapes of the variety Crimson Seedless packed in sales packages.

The lot consists of 92 packages weighing 5 kg each. Each package contains 10 sales packages of 500 g each. Whenever a lot is declared unsatisfactory the bulk sample shall comprise at least 5 packages (primary samples) for a lot of this size. First, the external appearance (cleanliness and intactness) of the primary samples is checked as well as completeness and correctness of the marking. In a package containing sales packages it is checked whether the indications on the package and on the sales packages are not in contradiction.
At the next step, the produce is checked for respecting the marketing standard. To this end, each sales package is emptied and defects assessed. It is recommended that the inspection result is noted on an inspection sheet.

In the example, the lot shows the following defects: 440 g (= 3 % of the bulk sample of 15 kg) of the table grapes are not clean, not sound, not free from pests, not free from damage caused by pests affecting the flesh or show underdeveloped berries. This is exceeding the 1 % tolerance allowed in Class I for produce not satisfying the minimum requirements or decay.

424 g (= 3 % of the bulk sample of 15 kg) of the table grapes show skin defects, scattered berries or loose berries. This is within the 10 % tolerance allowed in Class I for produce not satisfying the requirements of the class.

2,016 g (= 13 % of the bulk sample of 15 kg) of the table grapes are bunches below 75 g. This is exceeding the 10 % size tolerance for produce not satisfying the requirements as regards sizing.

As some bunches are only light red coloured, a check of the refractometric index (content of soluble solids) is carried out based on the reduced sample (5 % of the composite sample = 750 g). All bunches of the reduced sample give readings above 20 °Brix, while the standard requires 16 °Brix for seedless varieties.
Thus, the lot is not in conformity with the standard. A report of non-conformity is issued.

The non-conformities are:

- 3% of table grapes not meeting the minimum requirements (not sound, not clean, not free from pests, not free of damage caused by pests, and not free of underdeveloped berries) and

- 13% not meeting the minimum size of the bunch.

The lot must not be marketed. The trader may decide to bring the lot into conformity by re-sorting the produce or cut all bunches to „single servings“ (bunch weight below 75 g) and present the lot for a second inspection before it is marketed on the fresh market. The trader may – as a second option – process the table grapes in a fruit salad.

The guideline will be a good basis for the training of inspectors but also contribute a lot to the harmonised implementation of conformity checks by inspection services. Thus, the publication of this guideline in 2014 might be interesting. In the meantime, the member states of the OECD Scheme have to work on the final draft. In parallel, Germany is preparing a translation in order to provide a German version as quickly as possible after publication of the original version in English and French.
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