Avocado quickscan report

Assessment of the Colombian export supply chain quality

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Preface

Matthijs Montsma from Wageningen University and Research visited Antioquia, Colombia to carry out a quick scan of the avocado production/distribution supply chain as part of the project Establishing a national quality standard for the Colombian Hass avocado sector, commissioned by the Centre for the Promotion of Import from developing countries of the Dutch government and financed by the Netherlands Enterprise Agency. The objective of the quick scan is to understand the actual standard of the international avocado supply chain. The results of this quick scan are input for the overall objective of the project, to provide input for a better, more complete and up-to-date national quality standard that takes into account the optimal conditions for optimising avocado quality during transport, ripening and shelf-life in Europe. Furthermore, the objective of the project is to professionalise the Colombian private avocado sector to increase the exports of all Colombian exporters (and their suppliers) of Hass avocados that meet European quality standards. Therefore during the quick scan an avocado postharvest technology seminar was organised. The visits where organised by consultant Maria Isabel Lopez Munera of CBI and researcher Pablo Rodriguez Fonseca of Corpoica (Agrosavia). The quick scan was independently executed by Wageningen University and Research.
Colombia exports avocado mainly to Europe. At arrival after sea transport there are several complaints about the quality. The main problems are heterogeneity in dry matter, external discoloration and internal browning. The insights of this quick scan are the basis for the set-up of experimental pilots in order to improve export quality and finally help to develop a postharvest protocol/standard for Colombian avocado producers.

Itinerary of the visit:

- On June 20, a meeting was held at the production site El Cebadero of Fruty Green in order to discuss the production process of avocado and the quality standards used at harvest.
- On June 21, a seminar was held at the Universidad Catolica de Oriente about postharvest of Hass avocado organised by ProColombia. Matthijs Montsma gave a presentation on the basics of postharvest management and more specifically on avocado and mango postharvest quality. In the morning a meeting was held at the production site Finca Escondida of Cartama in order to discuss the production, harvest and postharvest practices.
- On June 22, a meeting was held at the pack house of Hass Colombia in order to understand the logistics and postharvest practices from harvest to destination in Europe.
- On June 23, a wrap-up meeting was held at Corpoica in order to discuss the collaboration on and set-up of the pilot shipments based on the gathered information of the visits.

Earlier in 2017, a meeting was held at the pack house of WestSole in order to discuss postharvest issues of the Colombian avocado supply chain.

Summary

A quick scan is carried out within the project, establishing a national quality standard for the Colombian Hass avocado sector executed within the programme Tropical and Exotic Fresh Fruit in Colombia of CBI. Agrosavia is a partner in the above mentioned project. The main objective of the quick scan was to find out critical points in export avocado supply chain and starting points for improvement. This report is describing the observations of the field trip to the main Colombian avocado production region, Antioquia. Avocado producers, a packing house and research facility were visited. In general the Colombian avocado sector is applying a clear postharvest protocol. Most likely the growing conditions are the reason for most postharvest quality issues. Nevertheless the methodology for maturity measurement and temperature strategies after harvest can be improved. Therefore Wageningen Food and Biobased Research and Agrosavia defined two pilots in order to find postharvest solutions for the critical points of the Colombian Hass avocado sector.

1 Observations of the Colombian avocado export chain

The export departments of Hass avocados in Colombia are Antioquia, Caldas, Huila, Quindío, Risaralda, Tolima and Valle del Cauca. Antioquia, Caldas and Risaralda are responsible for almost 75% of the Hass avocado production in Colombia. The quick scan was focussed on these main production regions. In this chapter, a pointwise summary of the observations is given.

Production and harvest

- There is a big difference in size of production farms, from small (2ha) to big (>100 ha).
- In most visited orchards Avocados are produced on slope, which implies differences in temperature, soil type, soil and air humidity in the same orchard. Some growers differentiate lower parts of the orchards from higher parts.
- The main rootstock used are Antillano, Hass, and Criollo. In some cases it not known what rootstock is used due to uncertified propagating material. First results of Corpoica's research did not show more heterogeneity in orchards with many different rootstocks. This is not well controlled in Colombia.
- Calcium applications (soil and foliar) are seen as important in order to harvest optimal fruit quality.
- Irrigation may influence stress in an orchard and fruit quality.
- Blooming period of avocado trees is in March and August/September; the main harvest period is from November to March and minor harvest (Traviesa) from May to June.
- A long blooming period results in early mature and immature fruits at harvest. This year (2017) blooming in March was 1 month longer (2 months is normal) due to low temperatures, which caused heterogenic maturity levels of fruit within the tree.
- Fruit quality (e.g. ripening dynamic, weight loss and chilling injury during storage) shows differences in fruit from different orchards, but also within a single orchard.

From harvest to packing house

- The harvest criterion is mostly based on % of Dry Matter (DM) and should according to protocol be >21% and <27/30% (average 24%). DM is frequently measured in fruit from different orchards. The procedure of measuring is collecting fruit batches of different trees and locations of the orchard (at least 5 fruits per batch).
- Some producers harvest all fruit at once, other harvest in 2 or more picks depending on market price.
- Fruits are harvested in plastic crates. Bruising of the fruit must be avoided, because it may affect quality later in the chain. Colombian Hass avocados sometimes have protruding lenticels that are easily damaged during harvest, handling and packaging. Later in the refrigerated supply chain the damaged lenticels may lead to black dots on the avocado skin (maybe a kind of chilling injury). This problem also occurs in Peru and no solution has been found yet.
- At the orchard the crates are temporarily stored at a collecting point (covered/shaded). The same day, or latest the next morning, harvested fruit is transported to the packing house.
- In general, farmers try to transport the harvested fruit quickly from orchard to packing house in order to be pre-cooled within 24 hours from harvest.
- In most cases trucks used for transport to packing house have white covers (instead of black) and if needed they travel by night.
- Due to arrival of avocados from different farmers at the pack house at the same time, the time from harvest to refrigeration vary from 24 hours up to 48 hours.
- Internal product temperature at harvest may vary from 11°C to 23°C according the information obtained during the visits.

Sorting, packing, cooling, transporting

- Within 24–48h after harvest the product should be packed and cooled down to 6°C.

- There is no ethylene removal in any of the buildings. Sometimes ethylene measurements are done in order to know what the concentrations are.
- At the packing house, the receiving area is not conditioned. After disinfection, fruit is transferred to the sorting/packaging area, also not conditioned. According to obtained information during the visits it was stated that only one packing house in Colombia is completely conditioned in order to maintain a steady lower temperature.
- At the sorting line, crates are unloaded on a conveyer band, fruits are subsequently brushed and disinfected with prochloraz. Thereafter products go through a drying tunnel with forced air at ambient temperature. Damaged or malformed fruit are removed by hand and, in addition, scanned using NIR/camera technology. Discarded fruit (infected, too mature (colored), too small) are separated for the domestic market or used for processing. The remaining fruit is sorted by weight and size. The graded avocados are manually packed in carton (4 or 10kg) or plastic crates (10kg). The plastic crates have preference regarding ripening reduction during transport and storage due to an open structure.
- Some growers disinfect two times, in the orchard at harvest and a second time at arrival at the packing house. By doing so they reduced the presence of internal disorders at arrival in Europe significantly. (Note: in some countries, e.g. Brazil, the use of prochloraz (Sportak) is banned for disinfection of fruit).
- At the packing house from each batch of avocados again DM is determined and registered.
- The day of packing and the originating orchard is coded on the boxes.
- The (carton) boxes are stacked on pallets and prepared for export (coded and pallet protectors are placed).
- The pallets are precooled in 6/7 hours to 7°C and stored up to two days in cold rooms at a temperature between 5°C and 6°C. In some packing houses no forced air cooling, but regular air cooling is used, or fruit is stored the first hours in only regular cooling rooms at 6°C in order to cool down to 18°C before using forced air cooling. Temperature sensors are placed in fruit boxes (sometime stabbed into the fruit) during the process.
- In the cold rooms stacking and loading volumes are well optimised in terms of air and temperature distribution (space between walls and pallets; stacking height in relation with height of the ceiling).
- Maintenance is carried out in order to improve the cold chain.
- Precooled reefer containers are loaded at refrigerated docks.
- Transport to port is refrigerated; from port to arrival in Europe in general with controlled atmosphere (CA).
- Of each batch sample boxes are stored at transport temperature followed by shelf life test at ambient temperature in order to know quality development in time. Information of this simulation is used in case of quality issues at arrival.
- Transport time to port is 18 to 26 hours to Cartagena or Santa Marta, 8 to 12 hours to Turbo.
- At the port's container terminal inspection takes place (risk of cold chain disruption). During this process the fruit is reloaded to another reefer. After inspection the reefer container is sealed and pulldown is started to reach CA-conditions. CA-conditions are 4%/6% O2/CO2.
- Temperature recorders are located, 1 recorder in order to monitor temperature to port and 2 recorders for temperature monitoring until arrival.
- We have no data on the dynamics of the CA conditions during transport and if set points are met within reasonable time period.

Product quality at destination

- Interviews are held with several Dutch importers, to hear about their experiences with quality of Colombian avocados. Colombia is a new sourcing area and is interesting as price of demand for avocado's is increasing and price for these avocados is acceptable. The experiences with quality of Colombian avocados are varying per importer. Several have currently regular shipments, some have stopped after several pilot shipments, with disappointing quality as one of the reasons.
- Main quality issues which are mentioned, are heterogeneity in dry matter, external discolouration and internal browning. Some other issues like stem-end rot, anthracnosis and spotting are also named.
- The importers talk about a learning process, just like with other new importing countries. Standardization of processes during harvest and post-harvest, education and gaining more experience for all parties in the chain, seem to be the right way to help to accelerate the process

and improve quality. However, it is also needed to recognize and understand the differences in growing conditions and behaviour of the avocado from Colombia compared to other countries.

Anonymised answers on the questionnaire of the Dutch importers can be read in appendix 1 of this report.

2 Discussion

In theory, the production, processing and distribution of the Colombian avocado chain is well organised. It seems that the right protocols with respect to harvesting, processing and logistics are in place. Still, the quality at arrival in Europe is heterogenic in dry matter and colour (ripening), internal browning and other quality defects (like 'chilling injury').

Differences in growing conditions make it hard to apply the right production strategy. At harvest there are different maturity stages on the tree due to differences between orchards (age, production management, etc.) and within orchards (geographical variation (slope), variation in soil, water supply, temperature and humidity, etc.). It is difficult to see the maturity stage of each fruit on the tree at harvest. This is not only true for Colombian production but is a global issue and still needs to be optimized.

Regarding cultivation of Hass avocado, different production strategies are used in practice. Differences in pruning, fertilizing, weed control, insect and fungal control have influence in production and finally on the harvest product quality.
Therefore it is difficult to adapt one single postharvest strategy for each situation. It is clear that the growing conditions and production strategy have a big influence on postharvest quality. Nevertheless on the short term it is not likely that production optimization will take place.

After harvest clear postharvest protocols are used or at least are available. In practice some critical points are detected:

- Dry Matter content is the maturity indicator at harvest. A standard sample protocol is used. Globally the discussion is whether DM is the right indicator. Especially for Colombian Hass avocado, with heterogeneity problems, other indicators may be useful to measure. Firmness is suggested to be a suitable quality parameter.
- Refrigerating within 24 hours after harvest is known as helpful to reduce stem-end rot or expression of anthracnose. Practice does not always meet the standard protocol. Time from harvest to cooling is longer due to waiting time at arrival at the packing house. Conditioning of the packing house itself can contribute to a better postharvest performance of the Colombian Hass avocado.
- Technical issues are noticed. Mainly related to air circulation and leakages of the cold store. Most likely these issues lead to longer cooling time and thus more dehydration. Dehydration has a negative effect on product quality. Technical issues are easy to solve.

Based on this quick scan 2 pilot shipments are defined, taking into account the following hypotheses:
1. Firmness at harvest as indicator for ripening behaviour.
Cooling shortly after harvest will result in less internal decay/disorders.

Visited companies and persons

Company	Person	Function
Hass Colombia	Juan Restrepo	Managing Director
Westsole Fruit	Pedro Aguilar	Operational Manager
Fruty Green	Wilson Geraldo	Agronomist
	Ricardo Mejia	Operational Manager
Cartama	Juan Rafael Giraldo	Operational Manager
Corpoica (Agrosavia)	Pablo Rodriguez	Principal Investigator
Procolombia	Veronica Echeverri	Senior Advisor

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Annex 1 Questions and answers from the interviewed Dutch importers

Importer A

Question	Answer
Regular import from Colombia?	Yes
Period	April/May/June
Percentage of avocados used for ripening?	35%
What do you think about quality of Colombian avocados?	At this moment no problems. Each country has some problems, these are not specific for Colombia.
When are there quality problems	When it has rained/rains during harvest
What kind of quality problems?	Anthracnosis Mechanical damage Internal brown
Special remarks	With the booming market it is important to distinguish in product: variety, taste, color. Now it is all the same. This company performs own taste trials, no clear analysis yet of different origins. If we in Europe have too high quality standards we won't have enough avocado's, they will all be send to North America

Importer B

Question	Answer
Regular import from Colombia?	Yes since 3 years
Period	
Percentage of avocados used for ripening?	Almost 100%
What do you think about quality of Colombian avocados?	There is good production, almost too good (7 flowering periods). It is still new therefore growers are still learning. Also infrastructure is improving
When are there quality problems	Not specifically one period. Problems can often be brought back to a specific grower or field. This importer works with a group of growers and a packing station. This works well. From other importers they hear that there can be problems in peak period when there is a lot of fruit harvested and packing stations are full.
What kind of quality problems?	Heterogeneity in ripening
Special remarks	Colombia has future as avocado production region. Think about the long term, therefore pay attention to quality. Don't send everything, while knowing that it will not arrive with good quality.

Importer C – did not respond to the questionnaire

Question	Answer
Regular import from Colombia?	
Period	
Percentage of avocados used for ripening?	
What do you think about quality of Colombian avocados?	
When are there quality problems	
What kind of quality problems?	
Special remarks	

Importer D

Question	Answer
Regular import from Colombia?	Yes, ~40 containers received. Now via 1 supplier, will be probably 2-3 in near future.
Period	Since 1 year weekly delivery
Percentage of avocados used for ripening?	90%
What do you think about quality of Colombian avocados?	Varying experiences. Now it is better compared to the start. But there is more loss/waste compared to other countries (10-15% versus 5-6%). Quality is influenced by weather, production area, quality of processes (harvesting and post-harvest)
Is there a specific period with quality problems	Not clear yet
What kind of quality problems?	Non-uniform dry matter Stem-end rot Discoloration Internal browning Spotting (problems with lenticels, black spots)
Who notices the quality problems?	Some problems at arrival, some after ripening more visible
What should be improved?	Standardization harvesting process (just like other countries have done) (experienced personnel, no harvest after rain) Standardization post-harvest processes: packaging, sorting, pre-cooling
Special remarks	

Importer E

Question	Answer
Regular import from Colombia?	Yes, via 1 supplier
Period	Since last year. Sept-Jan and now May-
Percentage of avocados used for ripening?	95%
What do you think about quality of Colombian avocados?	Short shelf life is main issue compared with other countries. Colombia is still at the start and still needs to professionalize. Quality has improved since last year.
Is there a specific period with quality problems	Quality has improved during the year. This could be seasonal effect or more experience.
What kind of quality problems?	Short shelf life Stem-end rot Internal browning
Who notices the quality problems?	Themselves and customers. The quality can be good when transport starts, but collapses during transport to e.g. Scandinavia
What should be improved?	Professionalization of infrastructure, pack houses, harvesting process (dealing with altitude differences, various flowerings at the tree)
Special remarks	

Importer F

Question	Answer
Regular import from Colombia?	No, has tried with 4-5 growers. Currently they do try again some small amounts
Period	2 years ago, spring 2015, autumn 2016 and some in between
Percentage of avocados used for ripening?	Majority
What do you think about quality of Colombian avocados?	Disappointing results on quality, every time. Worked with different growers, shippers.
Is there a specific period with quality problems	
What kind of quality problems?	Internal browning (~50% of the batch, where normally this is <1%) Non-uniform color outside.
Who notices the quality problems?	After ripening. They don't hear complaints from the avocado's which are non-ripened, but it doesn't mean they are not there.
What should be improved?	It was difficult to exactly trace the origin of the problems. One of the things what he noticed is that the level of growing technology and experience is varying per grower, this could be improved. Also the long flowering periods in Colombia are difficult.
Special remarks	Will look for available quality reports

Importer G

Question	Answer
Regular import from Colombia?	No, have done a couple of pilot shipments.
Period	2 peaks in the year, not clear when exactly.
Percentage of avocados used for ripening?	Most of them.
What do you think about quality of Colombian avocados?	Quality is not stable Limited understanding of the season and behaviour of the Colombian avocado makes it still difficult to get uniform product. Non-clear definition of (start of the) season
Is there a specific period with quality problems	
What kind of quality problems?	Non-uniform maturity (dry matter).This is a problem for choosing the correct ripening strategies for the right customer demands. Also fruits not targeted for ripening started to turn already at arrival.
Who notices the quality problems?	
What should be improved?	More experience on behaviour pattern, by testing in correct season. It seems that growing conditions are very different than other countries, less clear marked periods for harvest. This has influence on how the avocados cope with transport, ripening, shelf life.
Special remarks	Quality is one of the challenges for Colombia, but also the certification for growers and packing houses is a challenge. It can take years to get certification. This is another reason why import is still limited.

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