Survey on the postharvest quality and management of dragon fruits exported from Vietnam to Holland

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1. Introduction

- A key export tree-fruit and having a significant strategic importance of Vietnam.
- After the two initial markets (China and Southeast Asian countries), Vietnam dragon fruit has penetrated to other markets such as the U.S. and European countries, where Holland is the main focus in the European market.
- The competitiveness of Vietnam dragon fruit is still poor due to a relatively high price and unreliable outturn quality.
- Dragon fruit quality is basically based on the quality criteria described by Woolf *et al.* (2006). However, the fruit quality requirement may be different in different consumption markets, and in general these requirements are usually determined for individual supply chain.
- Rejection of fruit at the market are partly due to improper postharvest management practices, in which, improper fruit temperature management is considered as a possible cause that leads to rot incidence and rapid quality deterioration

1. Introduction (*con.*)

- Hien and Tung (2003) reported that the optimal storage temperature of fruit was 5 °C and under this storage temperature, the dragon fruit quality could be maintained for to 4 weeks storage.
- Phong *et al.* (2010), using low temperature conditionings treatments prior to storage at 3 °C and showed that the fruit quality could be maintained for 6-8 weeks after harvest
- The efficiency of temperature management is very important to improve postharvest life and minimize rot incidence of dragon fruit

OJECTIVES

- To evaluate the quality and temperature of dragon fruit in two trial containers
- To evaluate the issues related to postharvest management of dragon fruits exported from Vietnam to Holland.

2. Materials and Methods

2.1 Survey Locations

In Field

Postharvest handlings in Field

The Packhouse Queen Dragon Fruit company,

Binh Thuan, Vietnam

Postharvest handlings in packhouse

CONTAINER

The Packhouse TFC company,

Rotterdam, Holland

Postharvest handlings in packhouse

Supper markets

2.2 Survey of issues related to quality management of fresh dragon fruit exported from Vietnam to Holland

+ Observations included temperature measurements and measuring fruit quality at key points from the packhouse and the importer; the postharvest handling during packing, storage and transportation were also recorded.

+ Interviews: Using the prepared questionnaire, interviews were held directly with the managers for the exporting and importers companies.

2.3 Survey on quality and temperature of dragon fruits in a transportation by sea from Vietnam to Holland

- **Precooled fruit**: Packed in 5 kg boxes and stacked into pallets and placed in a commercial coldstore under high air-flow condition for 1.5-2 days before loading into a container.
- **Non-precooled fruit**: Packed in 5 kg boxes and stacked onto pallets and placed in the commercial coolstore for only 2 hours before loading into a container.
- Fruit temperature was monitored using dataloggers in pallets in a commercial coolstore, and in the containers exported by sea.
- The containers were sent from the packhouse, Binh Thuan, Vietnam and arrived at TFC Company, Rotterdam, Holland. An external visual evaluation was made at removal from the containers, and fruit were then held at ≈20 °C for 4 days and external quality assessed.


Datalogger position
HOANG HAU DRAGON FRUIT
QUEEN FARM
THANH LONG HOÀNG HẬU
SIZE
Vietnamese Rare Fruit
PITAHAYA
SWEET
AND
FRESH
NGỌT
THANH
VÀ
MÁT
DỊU

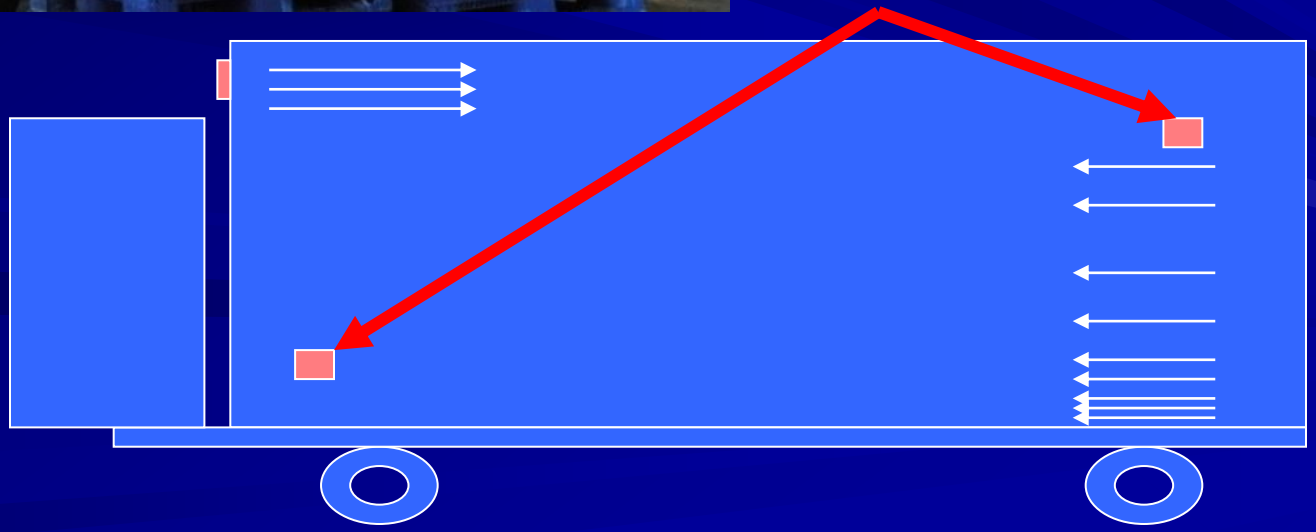
The commercial coolstore (capacity. 300 m^3) of the packhouse

(i) High air flow: directly in front of the evaporator fans

(ii) Medium air flow: on the ground approx 10 m from the evaporator fans

(iii) Low air flow: in the back corner of the coolstore, approx 20 m from the fans

Datallogers positions



3. Results and Discussions

3.1 Postharvest management of dragon fruit at the packhouse in Binh Thuan, Vietnam

Quality requirements of dragon fruits for export to Holland/Europe

- Fruit must be collected from dragon orchards that are GlobalGAP certified.
- Optimum fruit since is approx 400±50 g; with no defects, firm green bracts and stem, and the fruit skin bright red color.

3.1 Postharvest management of dragon fruit at the packhouse in Binh Thuan, Vietnam

Postharvest handling

- Harvested by hand and placed in 40 kg plastic crates for transport to the packhouse by truck.
- Fruit stems are cut and trimmed, the blossom end cleaned , the whole fruit is washed in clean water then soaked in Umikai solution, then dried by fan before being packed in a perforated PE bag.
- Dragon fruit are packed in carton boxes (1 layer with 9 fruits / box), then temporarily stored in a coolstore at 2-10 °C before loading into refrigerated container for export.

3.1 Postharvest management of dragon fruit at the packhouse in Binh Thuan, Vietnam

Temperature management

- Active temperature management nor monitoring is generally not carried out by the packhouse.
- Other than setting the coolstore and container temperature, temperature and cooling rate are not monitored, and the time fruit are held in coolstore is mostly not determined.
- Thus, fruit are loaded at a range of temperatures which can be as high as 35 °C.

3.2 Result of temperature monitoring of fruit in the commercial coolstore (capacity. 300 m^3) of the packhouse, Binh Thuan

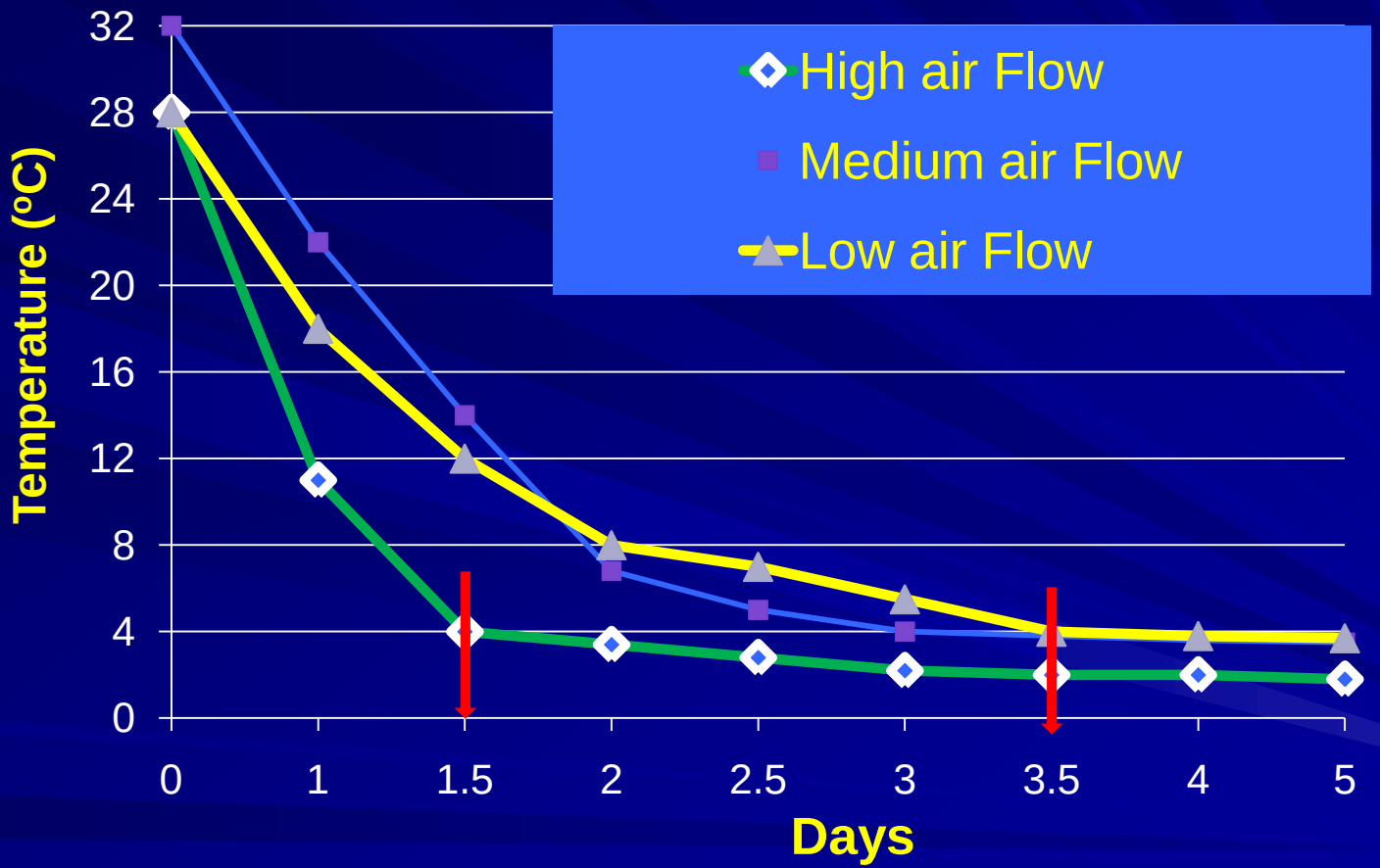


Figure 1: Fruit temperature graph at three air-flow locations in the commercial coolstore (Cap.300 m^3) Queen Dragon Fruit Company, Binh Thuan, Province.

3.3 TFC company and quality management activities on dragon fruits imported from Vietnam

Overview of situation from the Manager of the TFC company

- TFC has developed a major market of dragon fruit into Supermarkets in Holland.
- For a “promotion week” they will use 6 containers and one container in a non-promotion week
- Over most of the year, there are almost no fruit quality problems with 0-10% reject fruit, and many consignments with less.
- Problems with fruit quality are observed in the wet season (June – End Oct) with rejection rates of 35% to 100%, and an average of 66%
- Rots are the key reason for rejection.
- External appearance at receival is critical since even very small rots develop rapidly
- The disease symptoms are white spots

TFC HOLLAND

Vessel : Hanjin Bremerhaven

Container nr : TGHU 993748-4, SZLU 960935-1and TGHU993362-1

Reference nr : IO11-01501, IO11-1576 and IO11-01577

Temp. at arrival :

de	Size	Temp.	Colour	Decay Box 1	Box 2	Box 3	Box 4	Box 5	%	Photo	Remarks
02010311	9		Red	0	0	1	0	0	2,22%	7919	
18050211	9		Red	0	1	0	0	1	4,44%	7920	
03010411	9		Red	0	1	1	0	0	4,44%	7921	
19060211	9		Red	1	1	0	0	1	6,67%	7922	
31060311	9		Red	0	1	0	1	0	4,44%		
06020511	9		Red	0	0	0	0	0	0,00%	7923	Yellow "leaves"
09070511	9		Red	0	0	0	0	0	0,00%		Yellow "leaves"
34060511	9		Red	0	0	0	0	1	2,22%	7929,793	Yellow "leaves"
37050111	9		Red	0	0	0	0	0	0,00%		
03010611	8		Red	0	1	3	0	0	10,00%	7952 to 7954	Yellow "leaves"
28050611	8		Red	0	0	0	0	0	0,00%		Yellow "leaves"
4050611	9		Red	0	0	0	0	0	0,00%	7955	Yellow "leaves"
9050611	9		Red	0	0	0	1	0	2,22%		Yellow/green "leaves"
4070611	9		Red	0	0	0	0	0	0,00%	7956	Yellow "leaves"

Blad1 / Blad2 / Blad3

Inbox - Microsoft Out... | December | December | QC Report Red Pitah... | QC Report Red Pitah...

Microsoft Excel - QC Report Red Pitahaya 06-09-2010 BMOU 971629-8

Bestand Bewerken Beeld Invoegen Opmaak Extra Data Venster Help

Afbeelding 1

TFC HOLLAND

Product : Red Pitahaya

Container nr : BMOU 971629-8

Date : 6-9-2010

Reference nr : IO11-00003

Brand :

Temp. at arrival : 4,7

Code	Size	Temp.	Colour	Decay						Photo	Remarks
				Box 1	Box 2	Box 3	Box 4	Box 5	%		
O2010903	8	4,7	Red	7	5	7	7	7	82,5%	4381 to 4388	See photo's for example
O2010903	8	4,6	Red	7	7	8	7	7	90,0%		
O5011103	9	4,6	Red	9	9	9	8	9	98,0%	4389 to 4391	See photo's for example
O2010903	8	5,2	Red	7	6	5	8	8	85,0%		
O5011008	9	5,0	Red	7	9	8	8	9	91,0%	4400 to 4403	See photo's for example
O2010903	9	4,7	Red	6	8	8	8	8	84,0%		

3.3 TFC company and quality management activities on dragon fruits imported from Vietnam

Fruit handling and quality management activities at the importer, TFC company

- TFC is located 15 km from the port, and the container arrives within a few hours of unloading from the ship
- Fruit is remove from the container into the main handling area (8-10 °C) by hand (about 5 people / container) since boxes are not palletised in Viet Nam
- This takes at least 1.5 hours and results in box handling (and most likely fruit) damage.
- The lack of palletising in the seafreight container also most likely leads to poor temperature management due to lack of airflow
- QC will carry out a quick fruit assessment to determine whether repacking is re-packing
- Pallets are placed into a racked (3 layer) coolstore, generally within an hour
- Coolstore set at 2 °C
- Coolstores are equipped with ethylene scrubbers.

Handling Area: 8-10 °C

3.4 Assessment of quality and temperature of dragon fruits from two trial containers

General information

- Container temperature was set at 5±1 ^{o}C
- The voyage of the containers during shipping from Cat lai port, HCM city to Rotterdam port, Holland was 23 days.
- The voyage of fruit (from the harvest time to the arrival at TFC Company) was 25 days for dragon fruits of the non-precooled container and 27 days for dragon fruits of the precooled container.

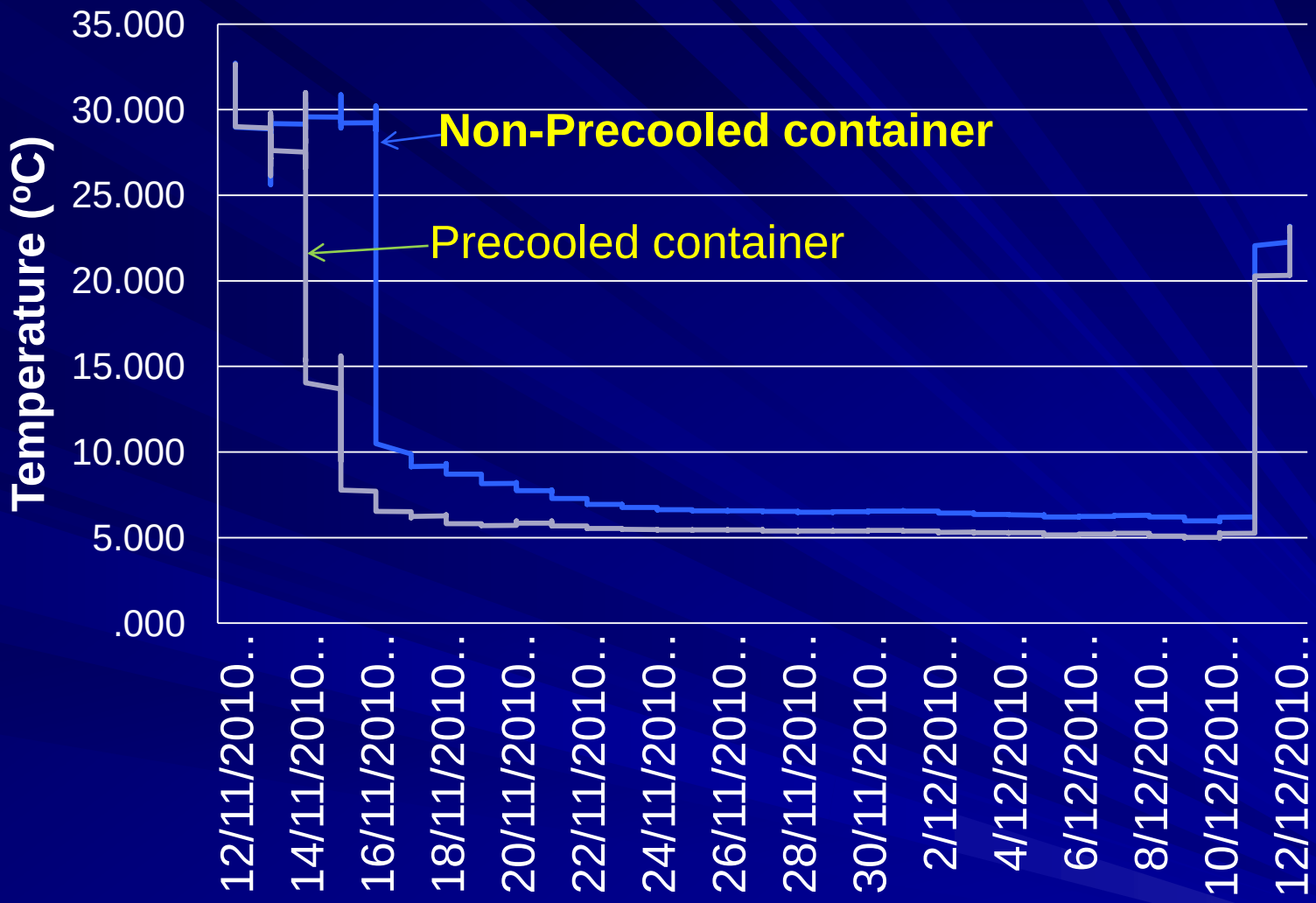


Figure 2. Temperature of the two containers exported from Viet Nam to Holland. Fruit for one container was cooled “precooled” in a coolstore prior to loading the container, and the other was not (“non-precooled”)

Table 1: Rot incidence and bract color of dragon fruits from the two containers exported to Holland from Vietnam

Non-precooled fruit

Sampling position in container	Number of rotten fruit (fruits/box/9 fruits)					Rotting rate (%)	Color of bracts
	Box 1	Box 2	Box 3	Box 4	Box 5		
Top	0	0	1	0	0	2.22	green, yellowish green
Middle	1	1	0	0	1	6.67	green, yellowish green
Bottom	0	1	0	1	0	4.44	green, yellowish green
Average						**4.44**	

Precooled fruit

Sampling position in container	Number of rotten fruit (fruits/box/9 fruits)					Rotting rate (%)	Color of bracts
	Box 1	Box 2	Box 3	Box 4	Box 5		
Top	0	0	0	0	0	0.00	green
Middle	1	0	0	1	0	4.44	green
Bottom	0	0	0	0	1	2.22	green
Average						**2.22**	


DRAGON FRUIT
Roza
PITAHAYA
火龍果
ROZA
SWEET AND YUMMY
Handbook

Precooled Fruit

The voyage of fruit (from the harvest time to the arrival at TFC Company)

27 Days

Non-precooled Fruit

The voyage of fruit (from the harvest time to the arrival at TFC Company)

25 Days

Table 2: Symptoms on dragon fruits collected from two trial containers

Symptoms	photos	Agents/Causes
Bract yellowing		The temperature of dragon fruits in this position was not adequately controlled
Condensation within bags and rotten tissue at stem end		A sudden rise in temperature when dragon fruit was transferred from coldstore to container.

Table 2: Symptoms on dragon fruits collected from two trial containers

Symptoms	photos	Agents/Causes
Browning burn of bracts		Directly contact with high cold air flow (very low temperature and high air speed)
Typical rot symptoms (white spot)		Fungal pathogen development

4. Conclusions and Suggestions

4.1 Conclusions

- The present postharvest management practices would be acceptable in the dry season (mid November-beginning May). However, it could result in high rot incidence in the wet season.

- Dragon fruit precooled before being loaded into the container resulted in better temperature control during shipping. The better temperature control resulted in dragon fruits with better bract green color and lower rot incidence.

4.2 Suggestions

- The air temperature in the container was always higher than 5 °C, so a lower set temperature, e.g. 4^{o}C may improve storage
- Dragon fruit should be precooled or held in a coldstore for 2-3 days before loading the container
- It is necessary to conduct further investigations to develop novel postharvest management systems for dragon fruit in the wet season.


Thank you for your attention !
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ピタヤ