Dienst Landbouwkundig Onderzoek
Instituut voor Agrotechnologisch Onderzoek

Test shipment of bell peppers, Almeria - Thapston

Report: B303/January

By order of KNP-BT

Gérard van den Boogaard
Anneke Polderdijk
Casper Willems

VERTROUWELIJK

ato-dlo

januari 1998

ATO-DLO

Test shipment of bell peppers, Almeria - Thrapston

Report: B303/January 1998

By order of:
KNP-BT

Confidential

Gérard van den Boogaard,
Anneke Polderdijk,
Casper Willems

Agrotechnological Research Institute (ATO-DLO)
Bornsesteeg 59
P.O. box 17
6700 AA Wageningen
tel. 0317 - 475000
fax. 0317 - 475347

Contents

Summary.

A Modified Humidity box (MH-box) for bell peppers has been developed by ATO-DLO in co-operation with KNP-BT. This MH-box has proven to have a positive effect on the keeping quality of Dutch bell peppers. The goal of this test was to investigate if the MH-box could achieve the same effect on the keeping quality of Spanish bell peppers when transported from Spain to Great Britain. The box that is commonly used by Hortichuelas (a Spanish horticultural co-operation) for the export of bell peppers was used as reference (the standard box).
The bell peppers were transported from Almeria, Murcia in Spain to Superior International Limited (a British importer of fruit and vegetables) in Thrapston, Great Britain. From the distribution centre in Thrapston the bell peppers were transported to the Tesco (a British supermarket chain) Harlow retail distribution centre and finally to a Tesco super market in Harlow.

The quality of the bell peppers was monitored during the distribution. The difference in weightloss of the bell peppers packed in the MH-box and the standard box after transportation and storage was 0,4%, this was less than expected. The small difference in weightloss is due to the good storage conditions (temperature and relative humidity) in the coldstore of Superior International Limited.

The shelf-life of the bell peppers transported in the MH-box was after 3 days of transport and 5 days storage 4 days. This was 2 days longer than the shelf-life of bell peppers transported and stored in the standard box.

Conclusions.
The effect of the MH-box on the quality of Spanish bell peppers is the same as on the Dutch.
The effect on the quality was less than expected due to good chain management.
The advantage of the MH-box increases when the distribution time increases and when the conditions during the distribution are less optimal.

1. Introduction.

A Modified Humidity box (MH-box) for bell pepper box has been developed by ATO-DLO in co-operation with KNP-BT. This MH-box has a positive effect on the keeping quality of Dutch bell peppers. The advantage of this MH-box is most clearly when bell peppers are transported over long distances like for example transport by ship to the USA. The goal of this test was to investigate if the same effect on the quality of bell peppers could be found when Spanish bell peppers were transported from Spain to Great Britain in the MH-box.
To quantify the quality advantage of the bell pepper transported in the MH-box, the quality of these bell peppers was compared with bell peppers transported in the regularly box for bell pepper used in Spain.
In Spain Las Hortichuelas was supplying the bell peppers and facilities for the test. In Great Britain Superior International Limited and Tesco were co-operating to carry out the test.

2. Materials & Methods.

2.1. Distribution.

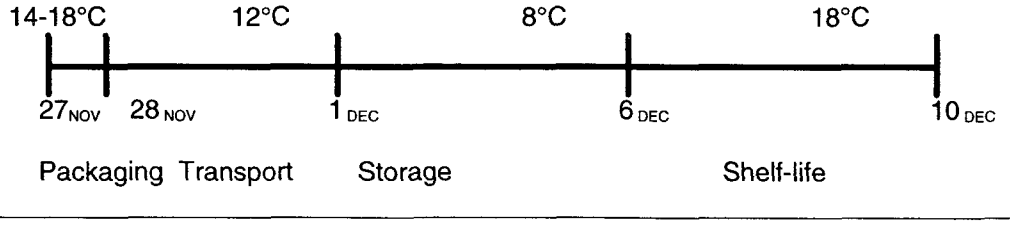
Product and Packing.
Figure 1 shows the time and temperature of each part of the distribution chain.
The test was carried out with red, yellow, orange and green bell peppers of the Californian type. These bell peppers were all grown by members of Las Hortichuelas. Each colour was from one grower and all bell peppers were harvested on the same day (26 November). Before packing the bell peppers were washed, and graded. In practise bell peppers with irregularly shape and other mishaps are put in second grade, the rest is used as first class These bell peppers were firm and wrinkelless. The size of the bell peppers was about 70 -100 mm which is comparable to Dutch bell peppers which are used for export. All bell peppers were harvested with stalk. The cut was not always on the abscission layer. Sometimes the stalk was damaged.

The bell peppers were packed in the MH-box and in the standard box, for each colour 20 boxes of each box type. The two different box types were put on separate pallets. Due to a shortage of 14 boxes of orange bell peppers this packing was not completed on Thursday 27 November so the two pallets stayed in the packing room overnight (14°C - 18°C).
The two pallets were rebuilt on Friday morning 28 November after the weighing and labelling of all boxes. Two loggers (temperature and relative humidity) were placed in each pallet. After this both pallets were replenished with second class red and green bell peppers up to the normal amount of boxes (11 layers). These complete pallets were tied up and put in the cold store (10°C) until shipping.

Transport and Storage.
The pallets were loaded on a truck on Friday afternoon 28 November. This truck arrived in Thrapston, Great Britain on Monday morning at 8:00 a.m. the first of December. The truck was unloaded. After quality inspection the pallets were placed in a coldstore (8°C) until the next quality inspection.

Retailer depot and Supermarket.
On Thursday 4 December 2 boxes per colour per box types were sent to the depot of Tesco Harlow for further distribution. These boxes arrived in the Tesco supermarket on Friday 5 December .

Figure 1. Storage conditions and duration during distribution



2.2. Measurements.

Temperature and relative Humidity.
The temperature and relative humidity (RH) were measured with Escort Junior temperature and RH loggers. Two loggers were placed in each pallet. One logger was put in a centre box and one in a box on the edge. The loggers collected data every 30 minutes from Friday 28 November until Saturday 6 December.

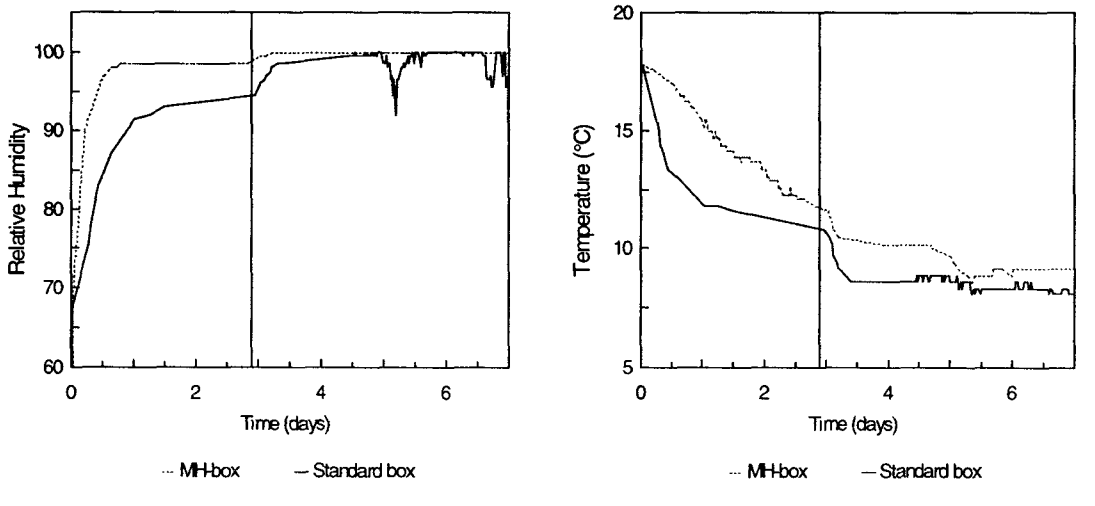
Product Quality.
Weightloss and firmness of bell peppers are very well correlated. The net input weight of the bell peppers was determined at Hortichuelas and four times at Superior International Limited. Firmness was judged by a product expert. This expert decides whether or not a bell pepper is firm enough for sale. Besides this the bell peppers were checked on deflections (rot and shrivelling). This quality check was done on Monday 1, Wednesday 3, and Saturday 6 December. After this check from each box type 2 boxes of each colour were put in the shelf-life room (18°C and 75% RH) and subsequently the shelf-life was determent. The shelf-life of the bell peppers is defined as the time in days before 10% of the bell peppers are judged by the product expert to soft and shrivelled. This is the standard used by ATO-DLO.
There were no quality checks on the product after the product left Superior International Limited. The boxes which were sent to Tesco Harlow were used as demonstration samples to convince the participants in the distribution of the benefits of the MH-box. The last quality check at Superior was synchronised with the arrival of the boxes at the shelves of Tesco.

3. Results & Conclusions.

3.1. Temperature and Relative Humidity.

The RH and temperature readings are shown in figure 2. This figure shows the average of the inside and the outside logger because there was only a little difference between both positions.
The conditions in the MH-box differ from the conditions in the standard box during the transport from Almeria to Thrapston. In this period the RH in the MH-box was higher (10%) than in the standard box. The average difference in temperature in this period between the two boxes was 2°C. This difference in temperature will have little effect on the quality of the bell peppers. In chapter 3.2. the weightloss caused by the combination of temperature and RH is discussed.

Figure 2. Relative Humidity and Temperature during transport and storage.



These figures show also that the temperature and RH control in the coldstore of Superior International Limited is near the optimum, 8°C and 95% RH for bell peppers (*J.J. Polderdijk et al. Scientia Horticulturae, 55 (1993) 315 - 321*).

3.2. Product Quality.

Weightloss, Firmness and Shrivelling.
The weightloss of bell peppers during the distribution is a very good indicator for the firmness and shrivelling of the bell peppers. The weightloss of the bell peppers is plotted in figure 3. After storage the difference in firmness of the bell peppers from the 2 box types was more or less the same. Differences in firmness will not show before the shelf-life period.

Figure 3. Average weightloss and Shelf-life of bell peppers. Comparison of bell peppers packed in the MH-box and the standard box.

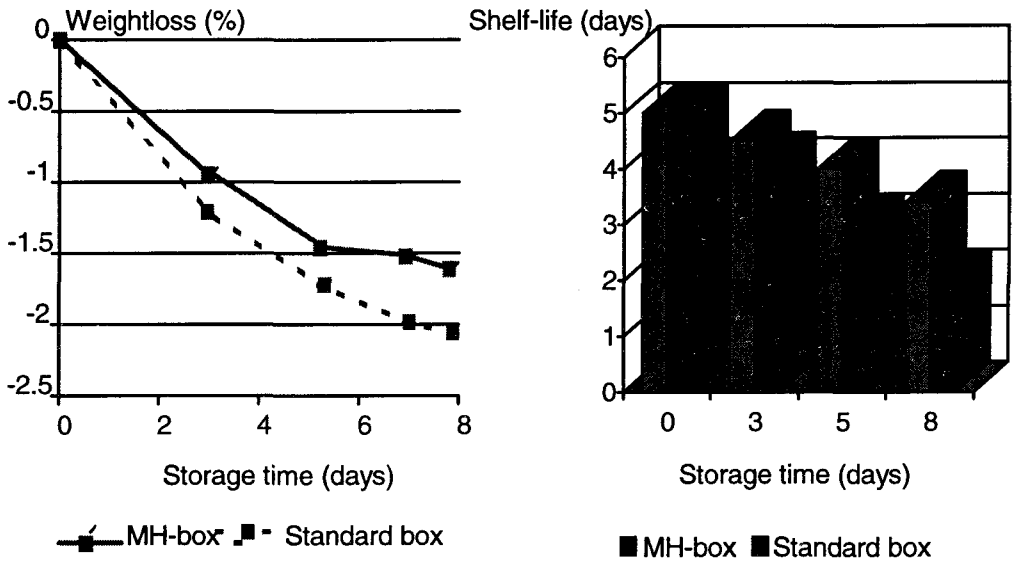


Figure 2 also shows a summary of the shelf-life in days (judged or measured) of the bell peppers after 0, 3, 5 and 8 days after harvest at the shelf-life room of Superior International Limited. The difference in shelf-life between bell peppers transported and stored in the MH-box and those out of the standard box increases when the bell peppers are stored longer: The difference between the bell peppers coming from the two box types is most obvious after eight days of storage. The bell peppers out of the MH-box have about 4 days shelf-life, the bell peppers out of the standard box have a shelf-life of only 2 days.

Rot and Mould.
The amount of rot found is summarised in table 1, this is the average per box type. Rot and mould were found at bell peppers from both box types and of each colour except the green bell peppers. There were no significant differences between both box types.

Table 1. Average percentage rot per box type.

	Percentage rot
Standard box	0,5%
MH-box	0,75%

3.3. Discussion and Conclusions.

The difference in weightloss between the bell peppers packed in the MH-box and the standard box was 0,4% after 8 days. This is less than expected. The small difference in weightloss is due to the good storage conditions in the coldstore of Superior International Limited. The storage conditions in the truck were less optimal but the transportation time was too short to have noticeable effect on the quality of the bell peppers regarding weightloss and firmness. Rot was a problem which did occur in both box types but there was no significant difference between bell peppers transported in the two different box types.
The shelf-life of the bell peppers transported and stored in the MH-box for 8 days was 4 days, this is 2 days longer than the shelf-life of bell peppers transported and stored in the standard box.

When the new box would be used in distribution channels which are longer and/or less well organised (suboptimal storage conditions) the benefit of the MH-box will be larger and show earlier during the distribution.