Expertise-Report for Cunningham Marine B.V.

Assessment of damage on Red Rosa plums in a Reefer container at Rotterdam, November 1998

CONFIDENTIAL

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1. Introduction

A Reefer container loaded with Red Rosa plums from Israel arrived at Rotterdam on 2nd November 1998. Many fruits showed "internal browning", which made the produce of the container unsalable as a fresh crop. The fruits could eventually be used for industrial purpose. Cunningham Marine (Marine Surveyors & Carriers Liability Adjusters) took a sample of fruits from the involved container CBHU 273198-4 and asked ATO-DLO at Wageningen to assess this sample. ATO-DLO was also asked to correlate, if possible, the assessment of the plums with the transport conditions during sailing from Israel to the Netherlands.

2. Transport plums

Mr H.L.H.M Braam from Cunningham Marine delivered information about the plums. The Red Rosa plums were harvested in the period 27-29 July 1998 in Israel. The fruits were stored in a CA room. Grading and packing of the plums in cardboard boxes took place between 9th and 14th October 1998. The fruits were put into 4 Reefer containers on 14th October. The temperature was set at +0.5°C. The containers were put on the vessel on 15th October. The vessel visited the harbour of Limassol and left one container indicated as CBHU 273198-4 in the harbour because of technical problems. The ship arrived in Rotterdam on 25th October 1998. The 3 containers were inspected and there was no quality problem. The container CBHU 2273198-4 arrived 8 days later than expected in Rotterdam on 3rd November 1998 and "internal browning" was detected in these fruits.

A sample of the load of container CBHU 273198-4 was taken by Mr Braam from Cunningham Marine and brought to ATO-DLO for assessment. (Description on the box: YEVULAY Galil L.T.D., Produce of Israel, Size = m, Diameter = 40-45 mm, Recommended Temp: 0-1°C, Class I, Red Rosa)

According temperature readings delivered by Cunningham Marine:

14th October: temperature in container CBHU 273198-4: 5°C and increasing
15th October mid: 9°C and increasing
   noon: 12°C strongly decreasing/strongly increasing
16th October mid: 11°C irregular
   noon: 11°C increasing/strongly decreasing
17th October mid: 0.5°C until 3rd November normal on 0.5°C. The temperature was measured on arrival at Rotterdam 2 hours after unloading and it appeared to be 4.5°C, whereas the temperature after the blowing unit was 2°C.
3. Assessment of the plums

The fruits were divided into “ripe” and “unripe” fruits on the basis of colour and appearance, and 25 fruits from each group were cut for inspection on internal browning. The assessment was done into 4 categories: none, slight, moderate and severe browning. Results are presented in table 1.

Table 1: Influence of ripeness on internal browning in % of assessed Santa Rosa plums

<table>
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<th>Ripeness</th>
<th>Brown discoloration of the flesh</th>
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<tr>
<td></td>
<td>None</td>
</tr>
<tr>
<td>“Ripe”</td>
<td>0</td>
</tr>
<tr>
<td>“Unripe”</td>
<td>4</td>
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Almost all the plums showed the problem of internal browning and the average degree of the disorder was rather serious, since 20% of the fruits was severely and 56% moderately affected. The difference between “ripe” and “unripe” plums was negligible.
Photographs (annexe) were taken from the package and individual plums after cutting the fruits.
The symptoms of internal browning agree well with the description of “Internal Breakdown” of plums in Agriculture Handbook 414 (Harvey et al, 1972): “development of breakdown starts near the pit and causing the flesh to become water-soaked and later to turn brown”; it may develop after a too long storage time or a higher temperature than the recommended 0°C.

4. Discussion

According recommendations for the storage of plums (Anon, 1984; Lutz & Hardenburg, 1977; Lidster et al, 1988; Kader, 1997) plums can be stored depending on the variety about 2-4 weeks at 0°C. CA conditions (>15%CO₂ and 1-2%O₂) may extend the storage period of Santa Rosa plums to longer than 4 weeks (Kader, 1997).
The plums in the containers had been stored from 27/29th July until 9/14th October, which means about 11 weeks. Sailing to the Netherlands took another 2 weeks in a normal atmosphere at low temperature. We could expect some senescent breakdown after this long storage period of 13 weeks, but apparently the plums in the 3 containers did not show any quality problem at inspection in Rotterdam.
The plums from the involved container CBHU 273198-4 had been stored altogether 14 weeks. The temperature in the involved container was much higher during at least 3 days (between 14th and 17th October) than the intended temperature of +0.5°C. The temperature in that period was between 5 and 12°C (air temperature) an it must be assumed, that the pulp temperature increased as a consequence of this heating of the storage air. The cooling equipment of the Reefer container generally can maintain the temperature, but it is mostly not able to bring down a certain pulp temperature. This may have resulted in an average higher pulp temperature in the period after 17th October 1998.
The increase in temperature during 14th and 17th October plus a possible average higher temperature than +0.5°C from 17th October till 2nd November will have resulted in a stimulation of ripening leading to the phenomenon of internal browning or internal breakdown as described by Harvey et al (1972).
5. Summary and Conclusion

Red Rosa plums were transported in 4 Reefer containers from Israel to Rotterdam in the Netherlands in the period 14th and 25th October. One of the containers, indicated as CBHU 273198-4, arrived 8 days later on 2nd November as a consequence of technical problems. Internal browning was found in the plums on arrival of this container. This browning must be attributed to the mentioned delay, during which the air temperature rose to 5 and 12°C during 3 days and a possibly higher pulp temperature than +0.5°C during the period after the mentioned 3 days. Also the week longer storage duration may have contributed to the problem of internal browning. This conclusion is based on the information given by Cunningham Marine and on ATO-DLO observations of the plums in the sample delivered by Cunningham Marine.

Literature


Annexe