



1-MCP can prevent ethylene-induced damage to fruit trees during cold storage



Frank Maas, Alex van Schaik, Marc op 't Hof, Ron Anbergen & Marc Ravesloot
frank.maas@wur.nl

Ethylene damage to fruit trees

Fruit trees stored in cold rooms between lifting in the nursery in autumn and planting in the orchard in spring, sometimes show severe damage to the bark. Ethylene exposure during storage is believed to be the cause of this damage. In this study the sensitivity of pear trees to ethylene was examined.

Experimental setup

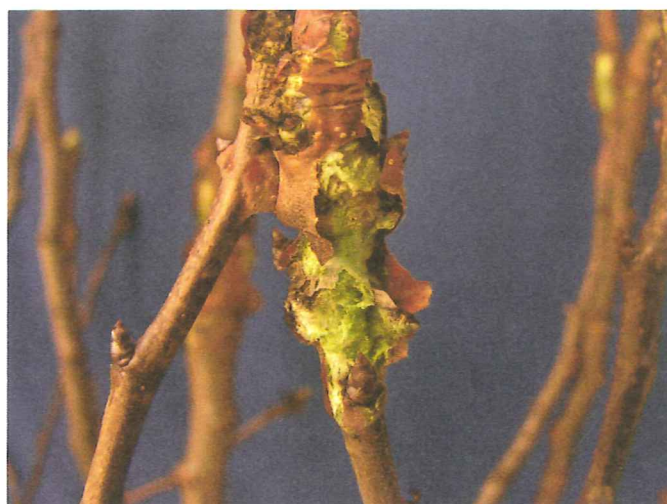
Two-year old 'Conference' pear trees grown at two different nurseries were used to test tree sensitivity towards ethylene. All treatments were carried out in duplicate with 5 trees each. Treatments were compared were:

- Time of lifting in the nursery: November, January and March
- Storage temperature: 0 and 4°C
- Ethylene concentration: 0 and 5 ppm
- Duration of storage: 1 week and 1 month.
- Pre-storage treatment: 0 and 24 h exposure to 1-MCP.

Results

- Bark damage on 'Conference' trees occurred when trees were exposed for 1 month to 5 ppm ethylene at 4 °C (Table 1).
- No ethylene-induced damage occurred when trees were exposed to 5 ppm ethylene:
 - at 0°C.
 - 1 week only
 - after treatment with 1-MCP
- Time of lifting had an inconsistent effect on ethylene sensitivity of 'Conference' trees.
- Ethylene sensitivity of 'Conference' differed between the origin of the trees, i.e. between the nurseries where they were grown.

Growth and establishment of 'Conference' trees in the orchard afterwards was not affected by the 1-MCP before the storage of the trees.



Bark damage of 'Conference' pear tree after 1 month exposure to 5 ppm ethylene during cold storage at 4°C.

Table 1. Number of bark damages on 'Conference' pear trees after cold storage at 0 or 4 °C. Trees were lifted in two nurseries in November, January or March and directly exposed for 1 month to 0 or 5 ppm ethylene after pretreatment with 0 or 5 ppm Smartfresh (1-MCP). Data represent the means of 5 trees ± standard deviation.

Temp °C	Ethylene	1-MCP	Bark damage (number of damage spots per tree)						
			Nursery A			Nursery B			
			Nov	Dec	Jan	Nov	Dec	Jan	
0	-	-	0	0	0	0	0	0	0
0	-	+	0	0	0	0	0	0	0
0	+	-	0	0	0	0	0	0	0
0	+	+	0	0	0	0	0	0	0
4	-	-	0	0	0	0	0	0	0
4	-	+	0	0	0	0	0	0	0
4	+	-	34 ± 13	15 ± 9	23 ± 8	56 ± 9	36 ± 3	37 ± 13	
4	+	-	21 ± 5	11 ± 2	36 ± 10	71 ± 12	34 ± 18	108 ± 12	
4	+	+	0	0	0	0	0	0	

Conclusions and further research

'Conference' trees are prone to ethylene-induced damage to the bark tissue when stored at 4 °C, but not when stored at 0°C. At 4°C trees become insensitive to ethylene after a 1-MCP pre-storage treatment. Further research is planned to reveal in more detail the duration of exposure, the concentration of ethylene, and the temperature during exposure at which ethylene becomes damaging to 'Conference' trees during storage.

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Symptoms of ethylene-induced damage to 'Conference' pear trees developed during 1 month cold storage.