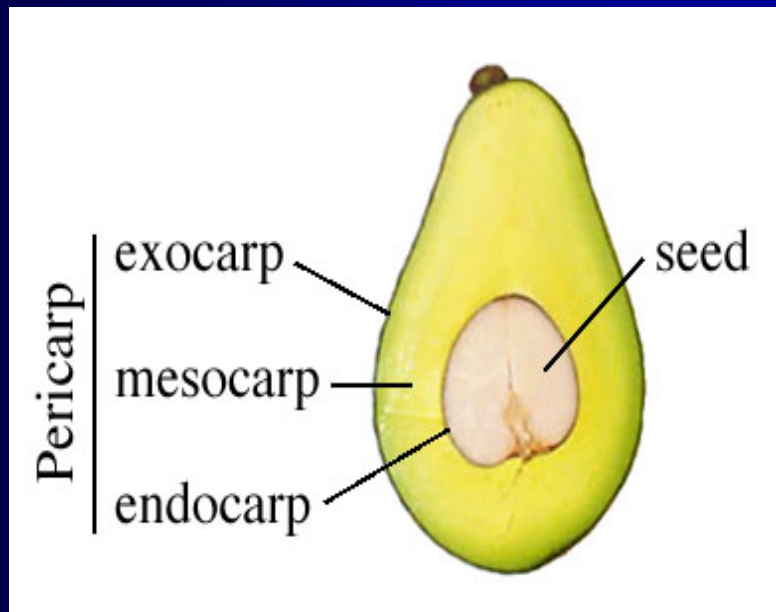


**The potential benefits of
1-methylcyclopropene (1-MCP) for
retarding ripening and extending the
storage life of avocados**

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Introduction

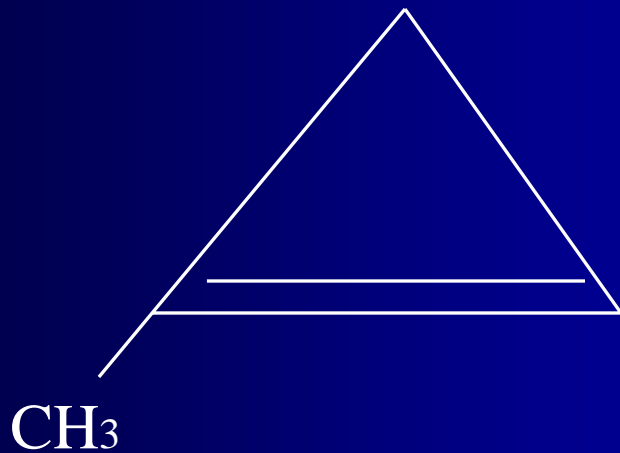


- **Scientific name:** *Persea Americana* Mill.
- **Family:** *Lauraceae*
- **Fruit type:** Berry
- **Races:** Mexican, Guatemalan, and West Indian
- **In FL:** West Indian and Hybrids (West Indian / Guatemalan)

Postharvest Physiology of Avocado

- **Climacteric fruit**
 - Enhanced respiration and ethylene evolution
- **Ripening**
 - 3 to 8 days, only after harvest, 15.5 to 24°C
- **Storage**
 - **West Indian and their hybrids**
 - cold sensitive, can be stored up to 2 weeks at 13°C
 - **Mexican**
 - cold tolerant, can be stored up to 4 to 8 weeks at 4.4°C

1-methylcyclopropene (1-MCP)



- **Gaseous ethylene-action inhibitor**
 - binds ‘irreversibly’ to the ethylene receptor
 - nontoxic
 - simple organic compound
- **Previous research**
 - Inhibits ripening of tomato, banana, and plum fruits

Objective

**To evaluate the effectiveness of 1- MCP
in retarding ripening and extending the storage
life of Florida avocado**

Fruits and Treatments

- **Avocado fruit**
 - **cv. Monroe and Booth7**
 - **West Indian / Guatemalan hybrids (cold sensitive)**
 - **Harvested in South Florida, Homestead**
- **1-MCP treatment**
 - **Use EthylBlock® powder to release 1-MCP gas**
 - **50 mg EthylBlock® powder + 100 ml water**

Measurements

- **Ethylene evolution**
 - GC (HP Model 5860)
 - expressed as $\mu\text{l C}_2\text{H}_4 \text{ kg}^{-1} \text{ h}^{-1}$
- **Respiratory rate (CO₂)**
 - GC (GowMac Model 580)
 - expressed as $\text{mg CO}_2 \text{ kg}^{-1} \text{ h}^{-1}$
- **Fruit firmness**
 - Instron Universal Testing Machine 1122
 - The peak force measured in Newtons
 - $>40 \text{ N} = \text{hard}$ and $10 - 15 \text{ N} = \text{fully ripe}$

Experiment 1 (cv. Booth 7)

Control - stored continuously at 12°C

Fruit treated with 1-MCP at 12°C for 24 h + stored at 12°C

After 10 days, some MCP-treated fruit treated with ethylene (100 ppm) at 20°C for 24 h + stored at 20°C

Fruit firmness (N) of 'Booth 7' avocados stored at 12°C after 1-MCP treatment. Average initial firmness was 140.6 N.

Treatment	Day 7	Day 10	Day 11	Day 13	Day 14	Day 15	Day 16
Control	29.7 b				11.0 b		
1-MCP	60.7 a	46.3	43.9	31.5	28.1 a	23.7 a	23.1 a
1-MCP + ethylene		46.3^x	41.2	21.8	15.9 b	13.4 b	11.3 b
P value	0.0001	NS	NS	NS	0.0001	0.0015	0.0046

NS - no significant difference at the 5% level of significance

^x - treated with ethylene (100 ppm / 20°C / 24h) and stored at 20°C

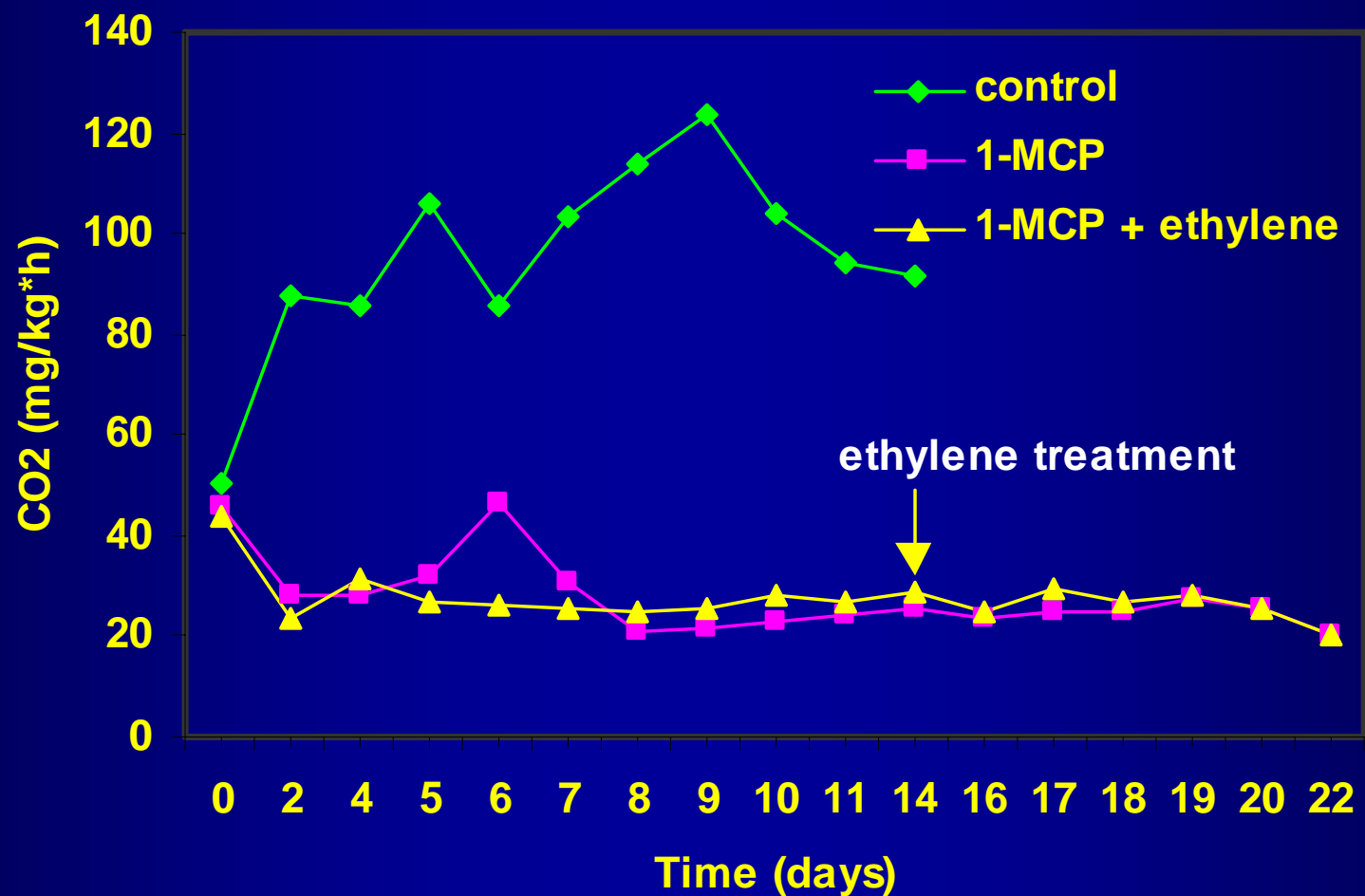
Experiment 2 (cv. Monroe)

Control - stored continuously at 13°C

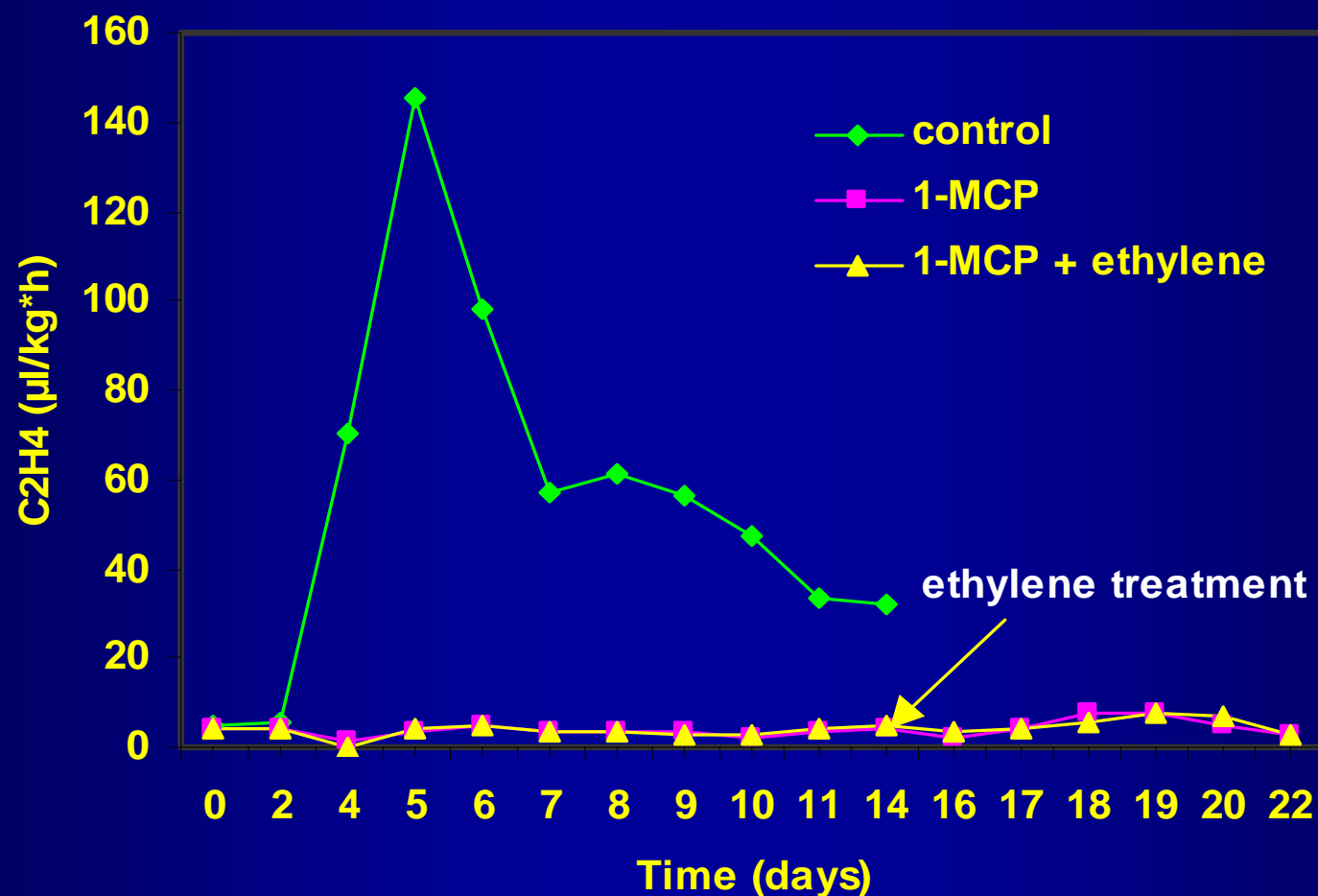
Fruit treated with 1-MCP at 20°C for 24 h + stored at 13°C

Fruit treated with 1-MCP at 20°C for 24 h + stored at 13°C for 13 days + ethylene (100 ppm) at 20°C for 24 h + stored at 13°C

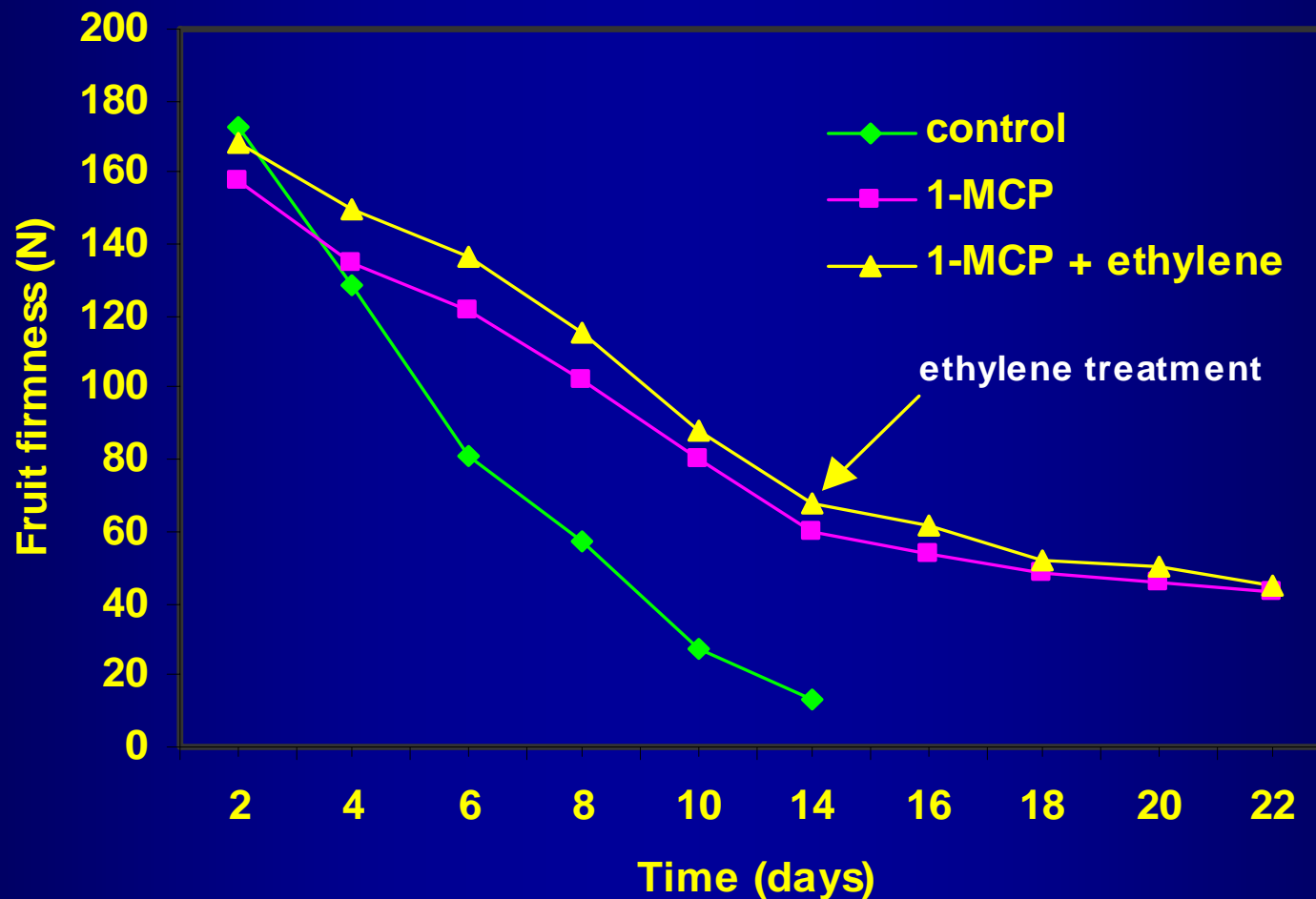
Respiration of 'Monroe' avocados treated with 1-MCP (20°C/24 h), then either stored at 13°C or gassed with ethylene (100 ppm/20°C/24 h) following 13 days storage at 13°C.



Ethylene evolution for 'Monroe' avocados treated with 1-MCP (20°C/24 h), then either stored at 13°C or gassed with ethylene (100 ppm/20°C/24 h) following 13 days storage at 13°C.



Fruit firmness (N) for 'Monroe' avocados treated with 1-MCP (20°C/24 h), then either stored at 13°C or gassed with ethylene (100 ppm/20°C/24h) following 13 days storage at 13°C.



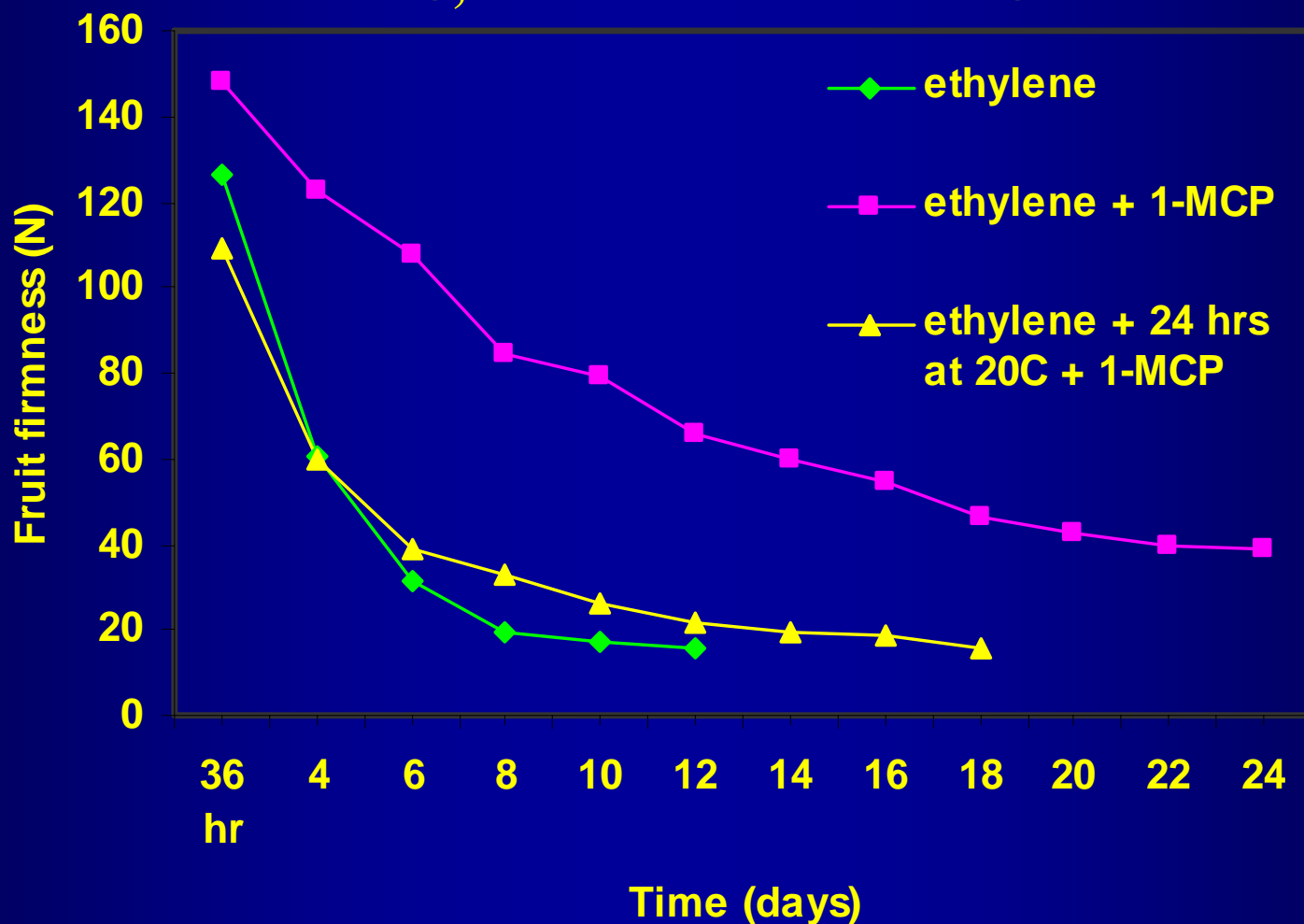
Experiment 3 (cv. Monroe)

Control - fruit treated with ethylene (100 ppm) at 20°C for 12 h and stored at 13°C

Fruit with ethylene (100 ppm) at 20°C for 12 h + 1-MCP at 20°C for 24 h + stored at 13°C

Fruit with ethylene (100 ppm) at 20°C for 12 h + stored at 20°C for 24 h + 1-MCP at 20°C for 24 h + stored at 13°C

Fruit firmness (N) for 'Monroe' avocados gassed immediately with ethylene (100 ppm/20°C/12 h), then either treated with 1-MCP (20°C/24 h) or treated with 1-MCP (20°C/24 h) following 1 day storage at 20°C, and then stored at 13°C



Conclusions

- **Avocado fruit softening was significantly delayed by 1-MCP**
- **1-MCP treatment prior to storage effectively suppressed both ethylene production and climacteric respiration**
- **1-MCP resulted in a significant extension of storage life to at least 3 weeks**
- **MCP treatment of early climacteric fruit was ineffective at suppressing ripening**
- **Future experiments will address the effect of [MCP] and temperature, and exposure duration on avocado fruit ripening**