Influence of 1-methylcyclopropene (1-MCP) and Temperature on ripening of avocado (*Persea americana*) fruit

Avocado

- The avocado (Persea americana Mill.) is a climacteric fruit
- The climacteric increase in ethylene production is associated with accelerated ripening
- "Slimcados" a Wester Indian variety of avocados grown in Florida, weight in up to two pounds, glossy green.
- Slimcados – 50% less fat and 35% fewer calories than Hass varieties.

1-methylcyclopropene (1-MCP)

- 1 methylcyclopropene (1-MCP)- blocks ethylene receptors and prevents ethylene effects in plant tissues
- 1-MCP is nontoxic, odorless, effective at low concentrations (0.5 nl L^{-1})
- A potent ethylene-action inhibitor
- Extend the shelf life and maintain quality
- Delay ripening, senescence and associated storage disorders.

Objective

- The objective of this work is to determine the effect of postharvest application of 1-MCP in avocado fruit ripened at 10 °C and 20°C, evaluating the changes in fruit firmness, peel color and respiration rate.

Materials and Methods

Plant material

- Slimcados [Persea Americana Mill. 'Booth 5' (West Indian hybrid)]

- Purchased from Publix Supermarket

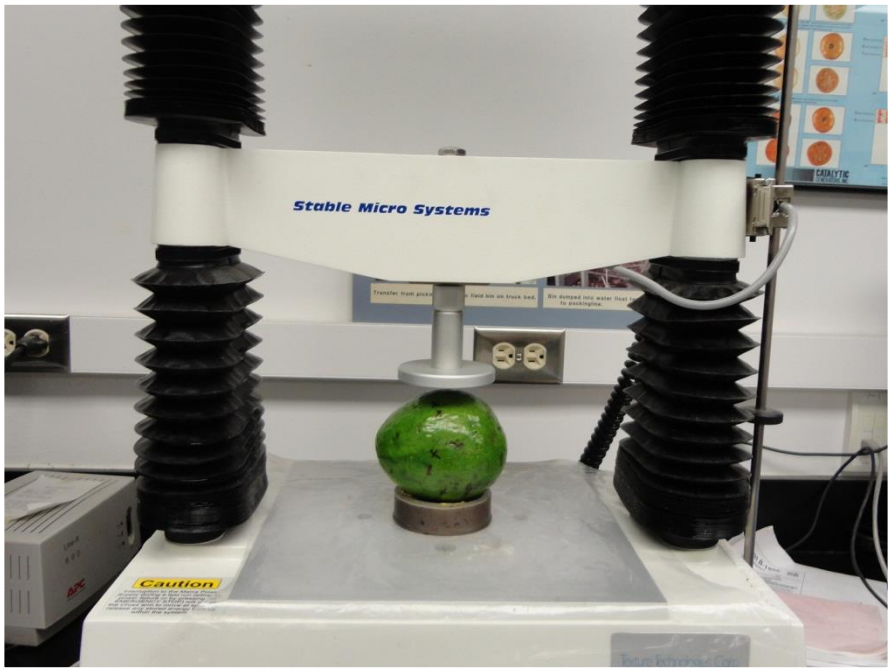
- Fruit divided into four groups of four fruit

Materials and Methods

1-MCP treatment

- Two groups of four fruit treated with aqueous 1-MCP (90 µg L^{-1})for 1 min
- Two groups of four fruits treated with deionized water for 1 min (CONTROL)
- Fruit wiped dry with towel paper and ripened at 10˚C and 20˚C
- Evaluations on the day of purchase and again every other day for two weeks.

Fruit firmness



- Whole, unpeeled fruit
- Instron Universal Testing Instrument (Model 4411, Canton, MA, USA)
- Compression using a 0.5 kN load cell and 5 cm diameter flat-plate probe.
- Force recorded at 2.5 mm deformation, determined at two equidistant points on the equatorial region of each fruit
- Same four fruit of each treatment measured repeatedly every other day for two weeks.

Peel color

- Color recorded at the equatorial region (two regions per fruit)
- Color was reported as hue angle (˚), with a value of 90˚ representing a totally yellow color, and 180˚ a totally green color.
- Minolta Chroma Meter CR-2000 (Minolta Camera Co Ltd, Japan)

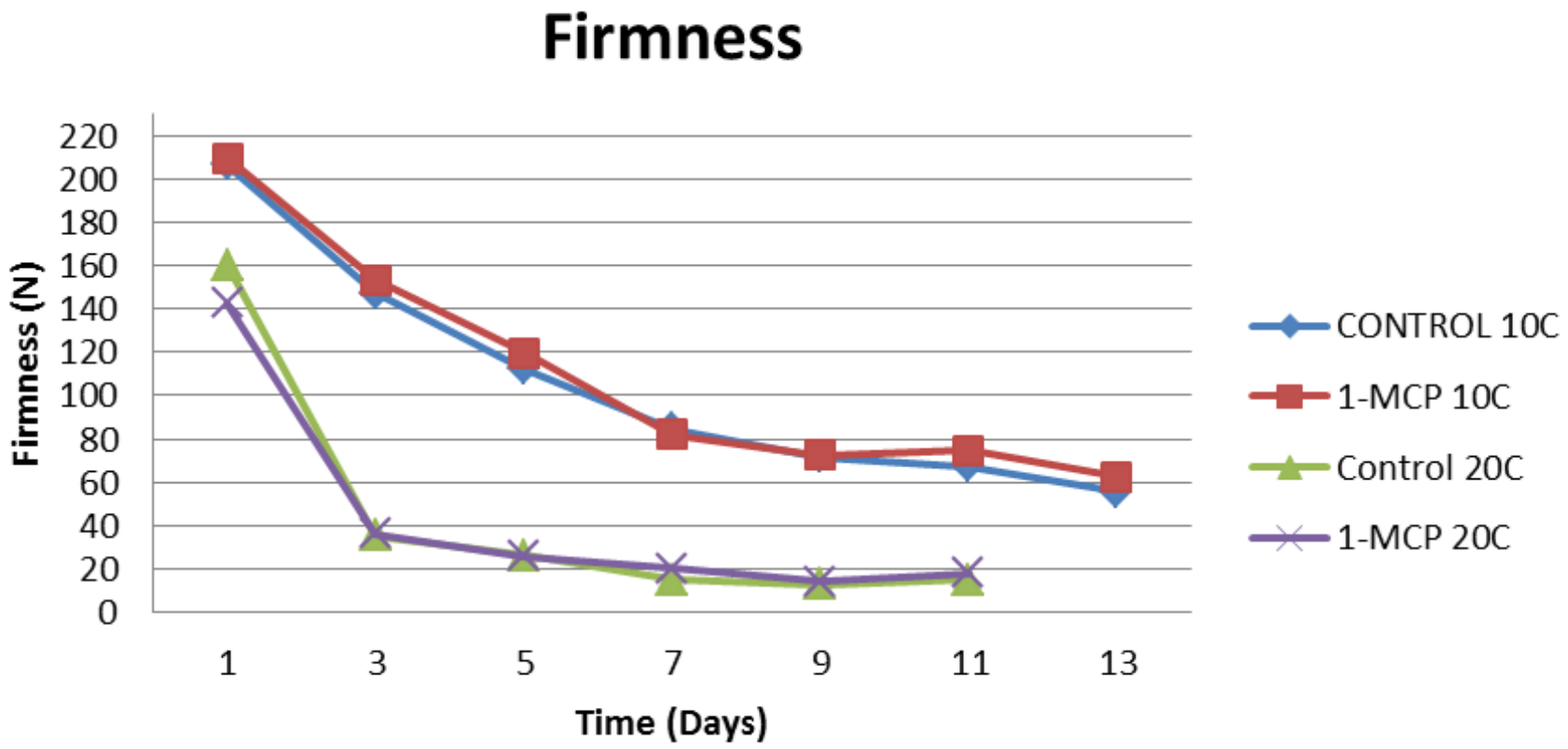
Respiration rate

Statistical analysis

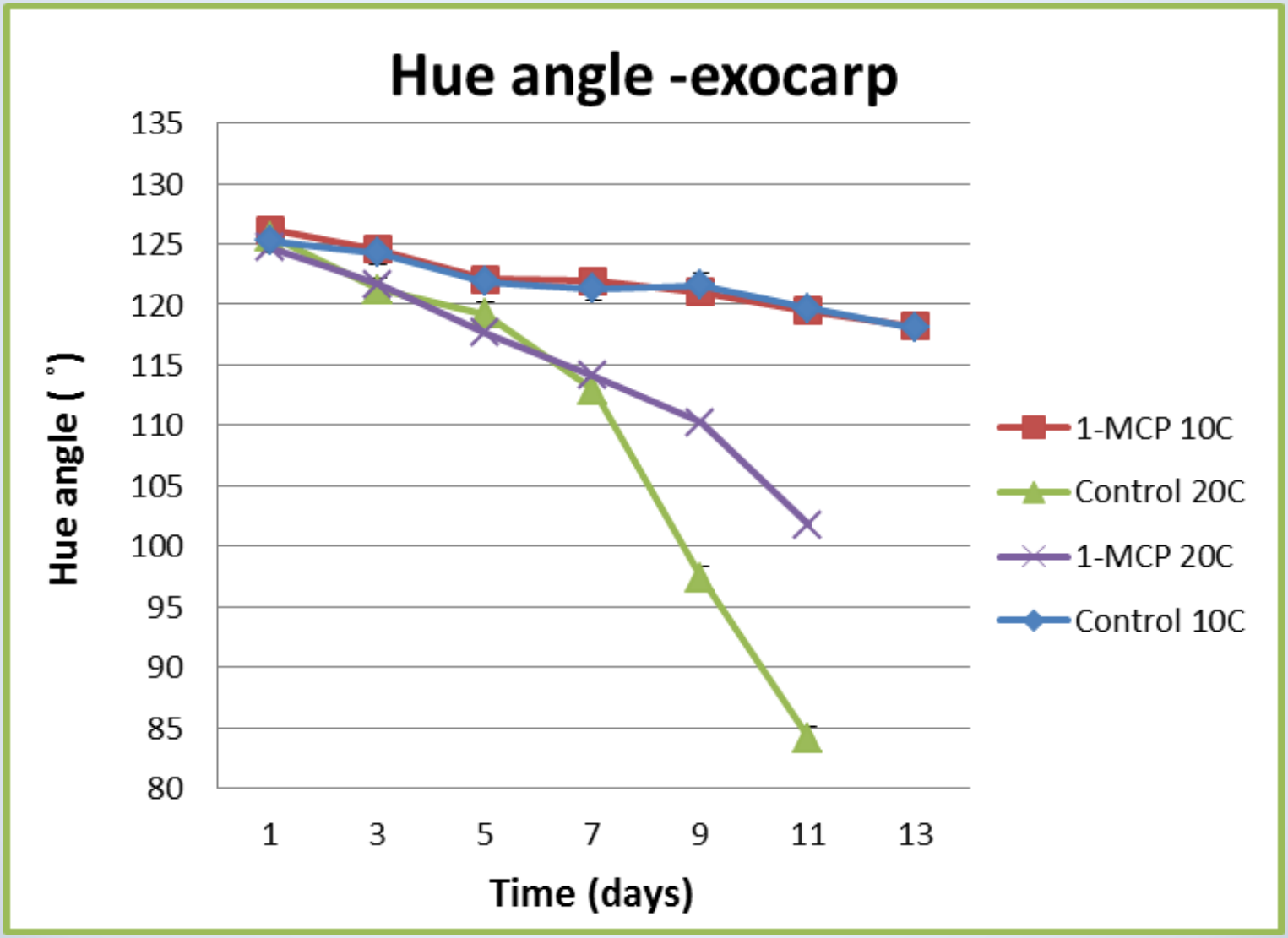
- Randomized complete block design, with four treatments (two temperatures, avocados treated with DI water and 1-MCP).

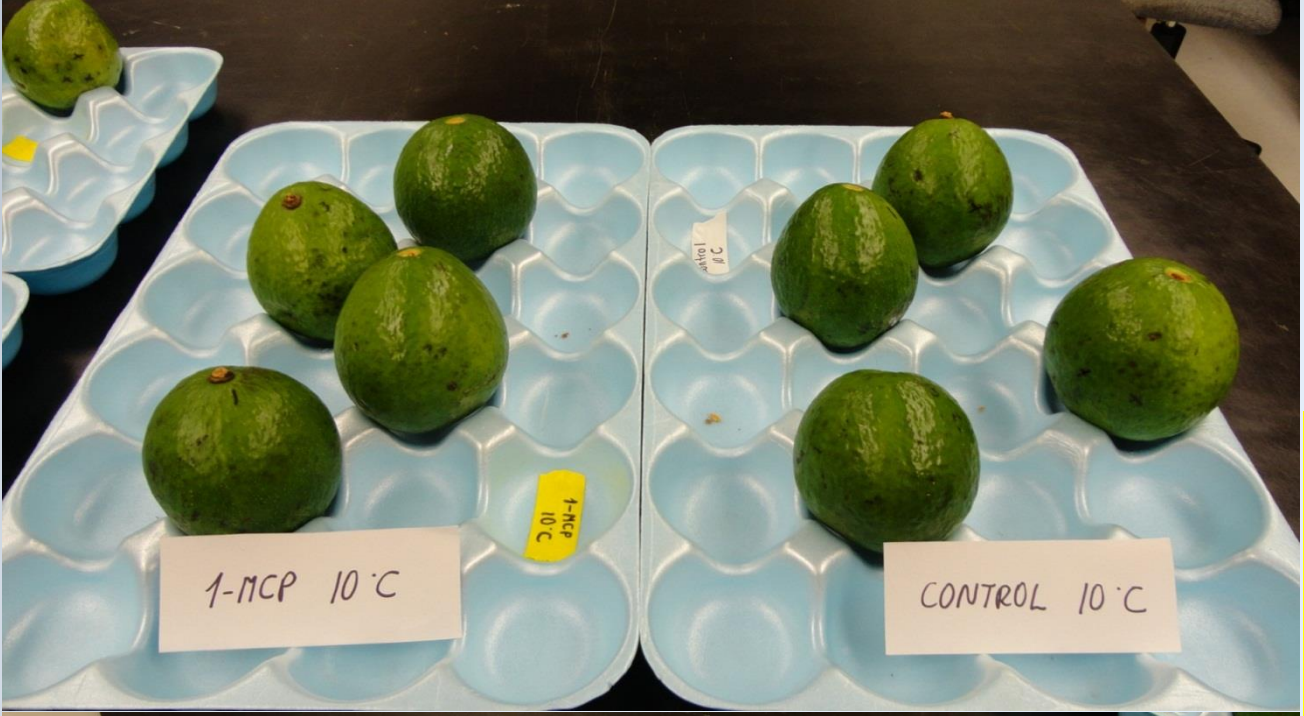
- SAS system version 9.2 (SAS Institute, Cary, NC) was used to perform Analysis of Variance (ANOVA) and to obtain mean separation by the least significant difference test ($P \leq 0.05$).

Results


Firmness
Firmness (N)
220
200
180
160
140
120
100
80
60
40
20
0
1
3
5
7
9
11
13
Time (Days)
CONTROL 10C
1-MCP 10C
Control 20C
1-MCP 20C

Results

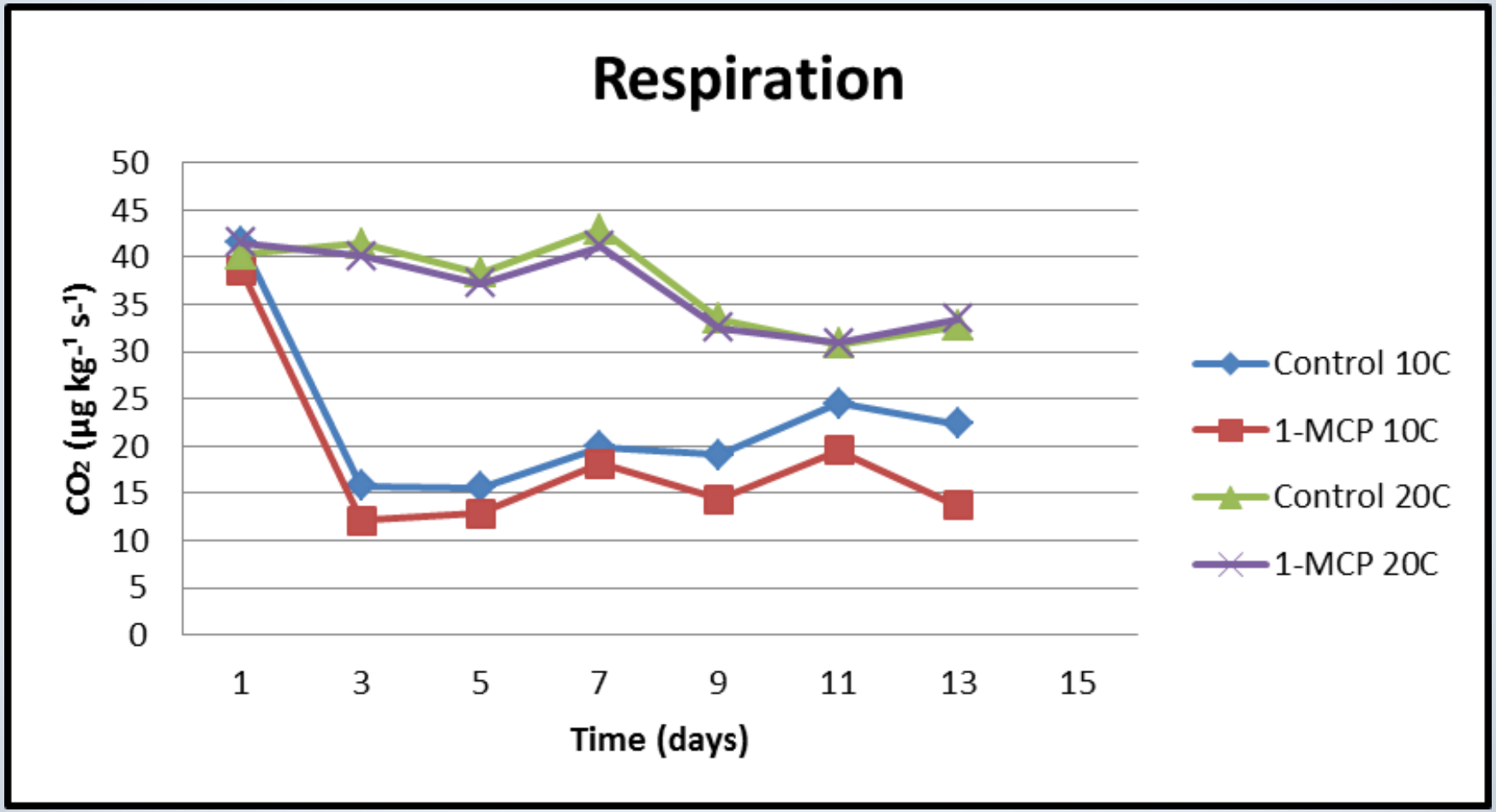

Hue angle -exocarp
Hue angle (˚)
135
130
125
120
115
110
105
100
95
90
85
80
1
3
5
7
9
11
13
Time (days)
1-MCP 10C
Control 20C
1-MCP 20C
Control 10C



7 days after storage

11 days after storage

Results


Respiration
50
45
40
35
30
25
20
15
10
5
0
CO2 (µg kg-1 s-1)
1
3
5
7
9
11
13
15
Time (days)
Control 10C
1-MCP 10C
Control 20C
1-MCP 20C


CONTROL 20°C
1-MCP 20°C
CONTROL 10°C
1-MCP 10°C

Conclusions

- In the present study using SlimCados, the use of 1-MCP did not extend shelf-life at 20°C beyond that achieved with avocados treated with1-MCP at 10 °C.
- This experiment using SlimCados showed that low-temperature storage (10°C) of fruit treated with 1-MCP resulted in an additional extension of shelf-life and quality maintenance compared with 20°C storage.
- Avocado fruit treated with 1-MCP stored at 10°C for 13 days exhibited delayed ripening, softening and respiratory climacterics.


Thanks!!