

# MODULATION OF 1-MCP EFFICACY IN MANGO AND PAPAYA FRUIT BY QUARANTINE HOT WATER TREATMENT

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## INTRODUCTION

Our research with 'Kent' and 'Keitt' mango has shown that aqueous 1-MCP provides a moderate delay of ripening but had a negative interaction with quarantine hot water treatment (46.1 °C, 90 min). Fruit treated with aqueous 1-MCP before or after heating developed fair to poor external appearance. By contrast, fruit treated with aqueous 1-MCP without heating showed delayed ripening without adverse effect. The objective of this study was to determine the physiological processes involved in the response of unheated and heated mango and papaya fruit to 1-MCP.

## MATERIALS AND METHODS

1-MCP sorption in whole or fresh-cut fruit was determined by enclosing mango or papaya fruit or tissue in plastic containers of 6.7 L that were sealed and injected with 20 µL L<sup>-1</sup> gaseous 1-MCP. 1-MCP depletion was monitored over 6 h using gas chromatography. For 1-MCP ingress in intact papaya, single fruit were placed in similar containers and gaseous 1-MCP injected at 20 µL L<sup>-1</sup>. At selected intervals jars were opened and fruit immediately immersed in plastic bins containing 10 L diH<sub>2</sub>O. Samples of internal atmosphere were taken by syringe from the apical, middle and basal tissues, and from the cavity of the immersed fruit. 1-MCP concentration was measured using gas chromatography. Internal gaseous 1-MCP in quarantine hot water heated (48.0 °C for 75 min) or unheated intact papaya fruit treated with aqueous 1-MCP was monitored in a similar manner.

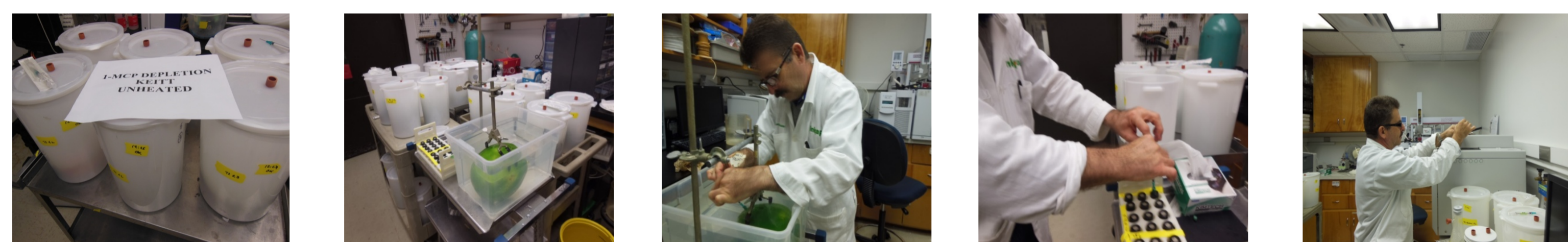


Figure 1. Detailed methodology

## RESULTS AND DISCUSSION

### a. 1-MCP Sorption by 'Kent' and 'Keitt' mango fruit

'Kent' and 'Keitt' mangos showed different patterns of 1-MCP sorption, but 1-MCP sorption trends were similar for heated and unheated mangos. Moreover, the 1-MCP sorption rate of fresh-cut 'Keitt' fruit was 2-fold higher than that of whole fruit.

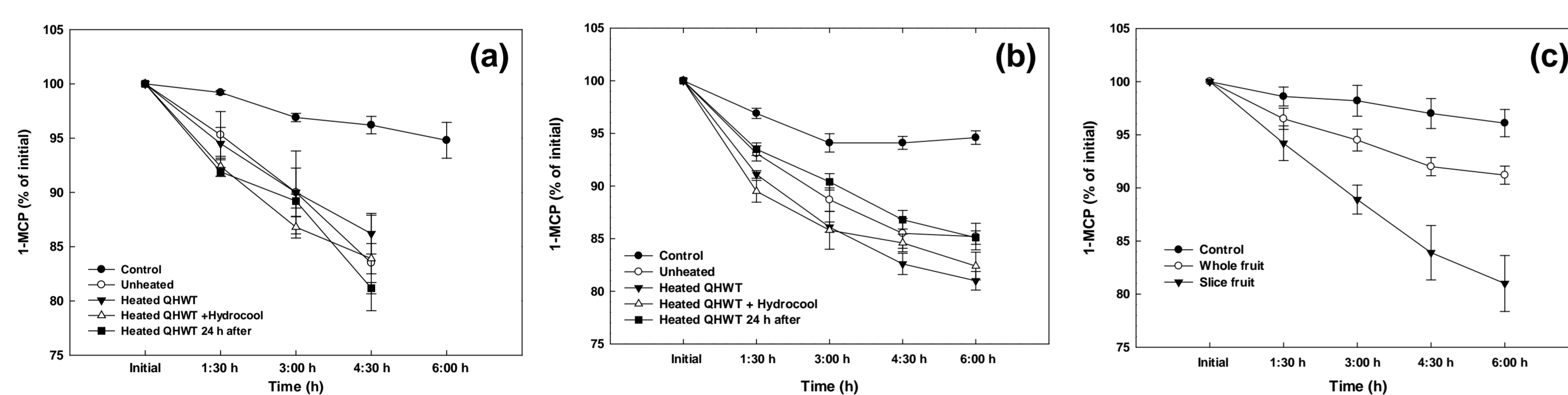


Figure 2. 1-MCP sorption by whole 'Kent' (a), 'Keitt' (b), and sliced 'Keitt' (c) mango fruit.

### b. Capacity of heated and unheated whole and sliced 'Solo' type papaya fruit to bind 1-MCP

In papaya, no significant differences in gaseous 1-MCP sorption were noted between heated and unheated whole fruit, but significant differences were found for fresh-cut tissue from heated and unheated fruit. Heated fresh-cut tissue adsorbed more 1-MCP than unheated fresh cut tissue.

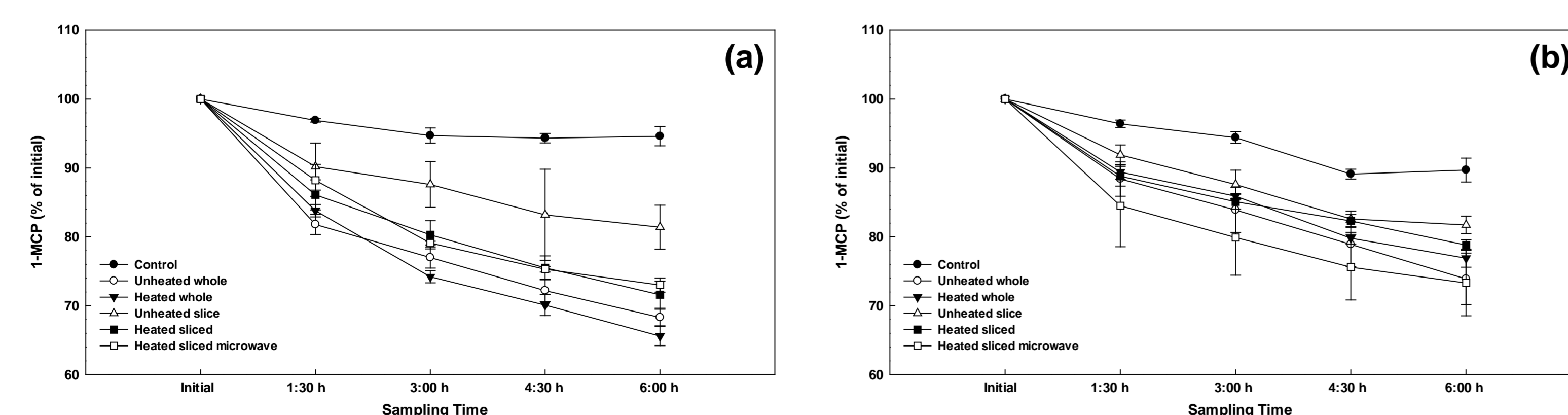


Figure 3. 1-MCP sorption by heated and unheated whole and sliced 'Solo' type papaya fruit in December 2013 (a), or January 2014 (b).

### c. Ingress of 1-MCP for heated or unheated papaya fruit

Significant differences were also found in papaya for gaseous 1-MCP exposure time: the longer the exposure time, the higher the ingress of gaseous 1-MCP.

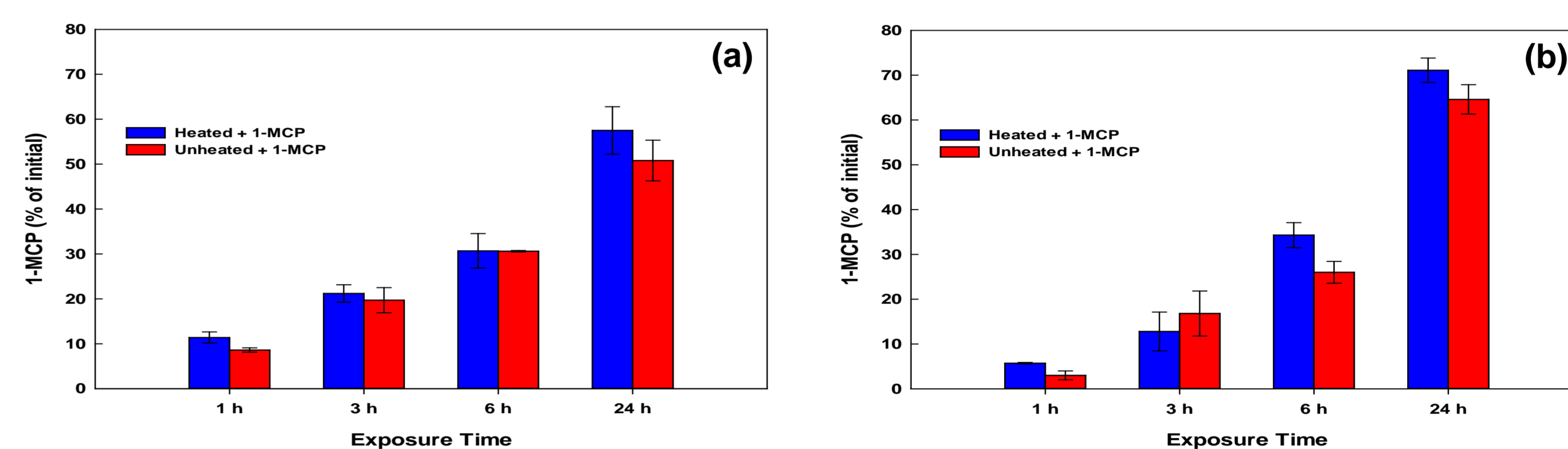


Figure 4. Ingress of gaseous 1-MCP on heated and unheated 'Solo' type papaya fruit in December 2013 (a), or January 2014 (b).

### d. Internal gaseous 1-MCP in heated and unheated 'Solo' type papaya fruit treated with aqueous 1-MCP.

Finally, with relation to experiments measuring the ingress of aqueous 1-MCP in papaya fruit, no significant differences were found between heated and unheated fruit, 1 or 5 min dipping time, or sampling regions (apical, middle, basal, or cavity). However, significant differences were detected between 1 mg L<sup>-1</sup> and 3 mg L<sup>-1</sup> 1-MCP in the experiment conducted in January, but not in the experiment conducted in December.

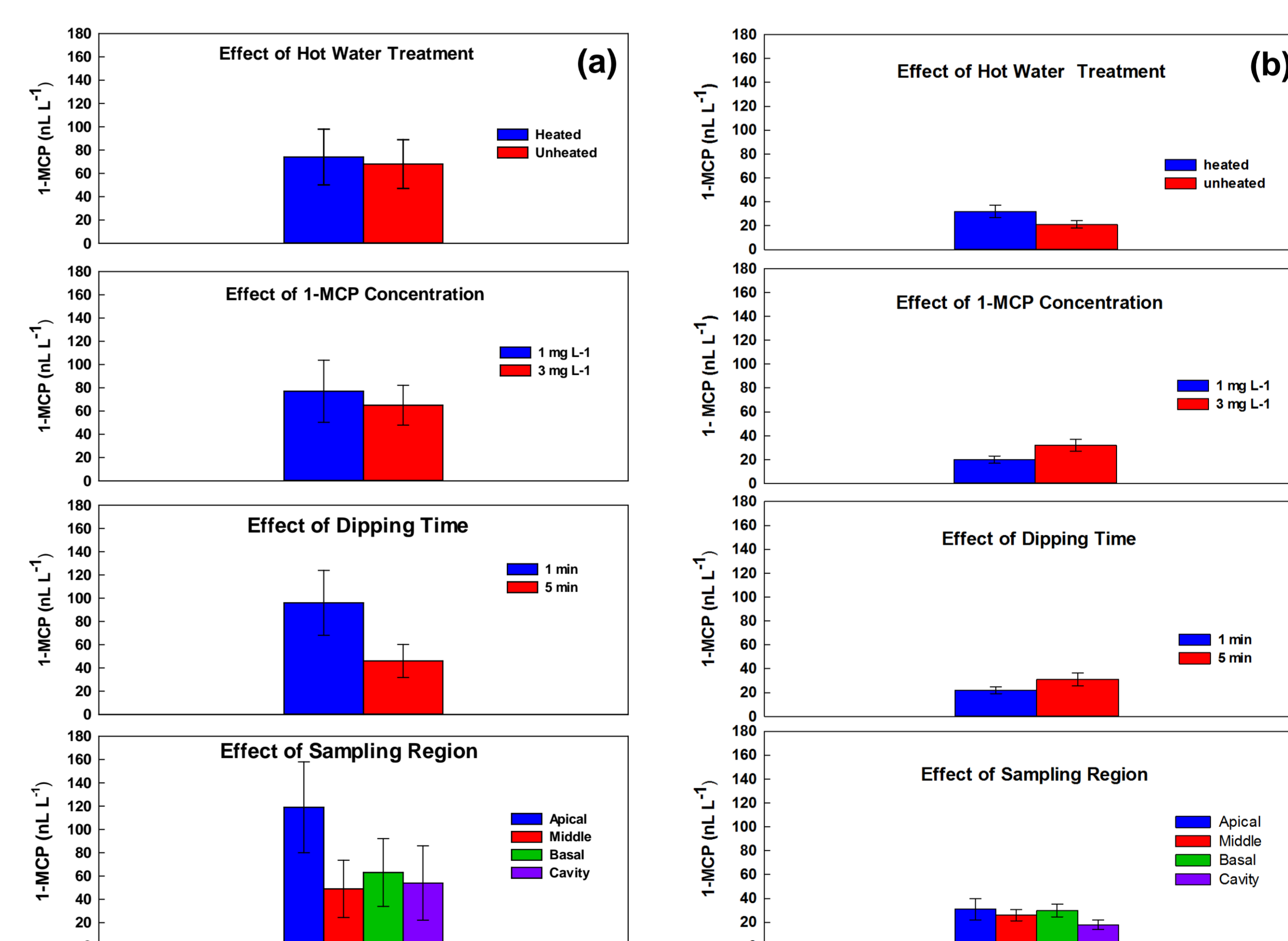


Figure 5. Internal gaseous 1-MCP in heated and unheated 'Solo' type papaya fruit treated with aqueous 1-MCP in December 2013 (a), or January 2014 (b).

## CONCLUSIONS

- No significant differences for sorption or ingress of gaseous 1-MCP were detected between whole heated or unheated mango and papaya fruit.
- Heated fresh-cut tissue adsorbed more gaseous 1-MCP than unheated fresh cut tissue.
- The ingress of aqueous 1-MCP in papaya fruit was influenced only for 1-MCP concentration but not for the hot water treatment, dipping time, or sampling region.

## REFERENCES

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