Ultralow Oxygen Treatment for Postharvest Control of Western Flower Thrips on Head Lettuce

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Western flower thrips, *Frankliniella occidentalis* (Thysanoptera: Thripidae), is a common pest of lettuce in California but a quarantined insect in some overseas markets and therefore affect export of U.S. lettuce. Controlled atmosphere treatment with ultralow oxygen (ULO treatments) was studied as an alternative to methyl bromide fumigation for postharvest control of western flower thrips on head lettuce. ULO treatments with different treatment times and temperatures were studied to determine the responses of the insect and effects on postharvest quality of lettuce. Pre-treatment storage was also studied for effects on reducing injury to lettuce heartleaves by ULO treatments.

Thrips were subjected to ULO treatments with different combinations of oxygen level, temperature, and treatment duration in plastic jars. Oxygen levels used ranged from 0.0015% to 0.01%. Temperatures ranged from 1 to 10°C. Treatment times were 2, 3, and 4 days. Thrips mortality increased with reducing oxygen level and increasing temperature. Selected ULO treatments with 0.003% oxygen for 4 days at 1°C, 3 days at 5°C, and 2 days at 10°C that killed >99.6% of thrips were also tested for effects on lettuce quality in large box chambers. Vacuum cooled commercial iceberg lettuce in cartons was treated in the large box chambers and postharvest quality was evaluated after two weeks of post-treatment storage. Shorter treatment at higher temperature was safer to lettuce than longer treatment at higher temperature. The two day ULO treatment at 10°C resulted in 8.4% of lettuce heads with miner injury to heartleaves as compared with 33.3% of heads with injury to heartleaves for the four day treatment at 1°C.

The two day ULO treatment at 10°C was also tested on fresh lettuce and lettuce which had been stored under normal or CA condition for one week to determine if pre-treatment storage could increase the tolerance of lettuce to the ULO treatment. Both types of pre-treatment storage prevented injury to heartleaves by the subsequent ULO treatment for control of western flower thrips. In contrast, 32-42% of fresh lettuce heads sustained injuries to heartleaves by the ULO treatment. The combination of 7 day CA storage and 2 day ULO treatment at 10°C was further tested and demonstrated to be effective in controlling western flower thrips and safe to head lettuce.