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Effects of Temperature, Relative Humidity, and Protective Netting on Ham Mite Infestation and Fungal Growth on Dry Cured Hams

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Objectives

Methyl bromide (MB) is a fumigant commonly used for pest control in the dry cured ham industry due to its efficacy for controlling ham mite infestations. The MB is an ozone-depleting substance and is being phased out of use and there is a need to find alternative methods to control ham mites. Temperature and relative humidity (RH) are critical for dry cured ham production, and also affect mite reproduction rate and mold growth on hams. Therefore, the objective of this research was to determine the most effective temperature and RH combinations to inhibit mite reproduction and mold growth on dry cured hams in untreated and food-grade ingredient infused nets.

Materials and Methods

Patent pending food grade coating formulations consisting of 1) 1% xanthan gum (XG) and 40% propylene glycol (PG) and 2) 1% carrageenan (CG), 1% propylene glycol alginate (PGA), and 40% PG were infused into ham nets. Dry cured ham slices (2.5 cm × 9.0 cm × 15.5 cm) were wrapped with untreated (control) and 2 types of infused (treated) nets (XG+PG and CG+PGA+PG) and stored in ventilated glass jars. Three slices from each treatment were inoculated with 50 large mixed-sex mites and tested in an environmental chamber for 14 d at each temperature (24, 28, and 32°C) and RH (55, 65, 75, and 85%) combination. The resulting mite infestation was determined by counting the mobile mites on ham slices, nets, and jars. Six to 8 trained panelists rated the amount of mold on the ham slice surfaces on a 0 to 100% scale. A 3 × 4 factorial arrangement within a completely randomized design with 3 replications was used to determine the impact of all combinations tested with respect to mite infestation and mold growth on ham

slices. Tukey's Honestly Significant Difference (HSD) test was used to separate treatment means ($P < 0.05$).

Results

On average, the number of mites on ham slices in untreated nets remained below the original inoculum level at 85% RH; the 32°C × 85% RH combination reduced mite counts to 1 mite on the 3 slices tested. The XG+PG net treatments inhibited ($P < 0.05$) mite reproduction on dry cured ham slices at all tested conditions (0 to 20 mites), with the exception of ham slices evaluated at 24°C × 65% RH (128 mites) and 28°C × 65% RH (54 mites). The CG+PGA+PG net treatments inhibited ($P < 0.05$) mite reproduction (0–31 mites) on dry cured ham slices at all conditions that were tested, with the 85% RH treatments completely inhibiting mite growth.

On average, ham slices in untreated nets were covered with 1 to 61% mold, and the maximum mold coverage was observed at 24°C × 65% RH. The use of XG+PG and CG+PGA+PG net treatments reduced the amount of mold on ham slices to a range of 0 to 9% and 0 to 13%, respectively. Complete inhibition of mold growth was observed at 24°C × 85% RH and 28°C × 75% RH for both net treatments.

Conclusion

The XG+PG and CG+PGA+PG net treatments controlled mite infestations and mold growth on ham slices at most conditions tested. Therefore, it is recommended to determine the efficacy of treated nets on mite infestation and mold growth of dry cured hams in a commercial setting.