POTENTIAL USE OF OZONE AT HIGH CONCENTRATION FOR RAPID INSECT AND MICROBIAL DISINFESTATION OF DURABLE COMMODITIES

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In this study the potential uses of ozone for rapid insect and microbial disinfestation of durable commodities were tested. Dried figs were treated by ozone fumigation to determine the effect of ozone on the count of total aerobic mesophyllic microorganisms, *E. coli*, coliform bacteria, yeasts and molds on dried figs. The toxicity was studied of gaseous ozone at low (1, 5 and 10 ppm) and high (50, 80, 120, 200, 300 and 400 ppm) concentrations to all life stages of *Ephestia kuhniella* (Zell.) at a 2 h exposure period. For penetration of ozone gaseouse, toxicity of ozone fumigation in presence of one and two kg of wheat to eggs, larvae and pupae of *E. kuhniella*, placed at different position of the commodity in fumigation chamber, for a 2, 3 and 5 h of exposure period was also tested.

Reductions in the counts of total aerobic mesophyllic microorganisms were 51.5% by ozone fumigation. Coliform bacteria were reduced from 2.5 log cfu/g to 1.8 log cfu/g (72.4%) by 30-minutes ozone fumigation, whereas *E. coli* was completely inactivated within 7.5-minutes ozone fumigation. After 30-minute ozone fumigation only 87.5% of the yeasts were eliminated, whereas all of molds were destroyed by 15-minutes ozone fumigation.

With regard to insect toxicity, all ozone treatments at low concentrations resulted in low mortalities of adults and larvae ranging from 3.3 to 21.7%. However, increasing of concentration of ozone gaseous clearly resulted in significant increase of mortalities for adults, larvae and eggs. The adults and pupae were the most easily killed, followed by the larvae and finally the eggs, which were the most tolerant (a mortality of 77.9% at highest concentration (400 ppm)). The results indicated that larva stage exhibited delay toxicity. Therefore immature stage exposed to ozone had to be held to determine emergence of adults. For ozone fumigation in presence of commodity there was a significant difference in the mortalities of the larvae, pupae and eggs placed in top and bottom of one and two kg of wheat. These results indicated that ozone gaseous could have a problem of penetration into commodity. Ozone alone was found to be effective against all the life stages of *E. kuhniella*, except egg stage, at a high initial concentration and short exposure time. Egg stage required more than 5 h exposure period to obtain the complete mortality.

These findings which show a high toxicity to a key stored product insect species and efficient elimination of microbial pathogens on a durable commodity provide promising data to justify further work for the development of the ozone technology.