EFFECTIVENESS OF NITRIC OXIDE FUMIGATION FOR MICROBIAL CONTROL ON STORED PRODUCTS

Sookyung Oh[1*] and Yong-Biao Liu[2]

[1]University of California Davis, Salinas, CA 93905
[2]USDA-ARS, Crop Improvement and Protection Unit, Salinas, CA 93905

Recently nitric oxide (NO) was discovered to be a potent fumigant for postharvest pest control. NO fumigation must be conducted under ultralow oxygen (ULO) conditions because NO reacts with O_2 spontaneously to produce nitrogen dioxide (NO_2). NO fumigation can be conducted under certain O_2 levels to have desired levels of both NO and NO_2. Because NO_2 has antimicrobial property, NO fumigations with desired levels of NO_2 may have potential to control both pests and microbes. Here we conducted laboratory NO fumigations under different levels of O_2 to determine effectiveness of NO fumigation in inactivating *Aspergillus flavus* spores on nitrocellulose membranes, controlling microbes on artificially infected corn kernels, and controlling microbial activity on unpasteurized almonds.

Spores of *A. flavus* on gridded nitrocellulose membrane discs in Petri dishes were fumigated with NO under different O_2 levels for 3 h at 15°C. The discs with spores were then incubated on Aspergillus Differentiation agar plates to estimate the colony forming unit (CFU) of *A. flavus*. Three fumigation treatments with 0.1% NO_2 yielded complete or near complete inactivation of *A. flavus* spores. Corn kernels infected with *A. flavus* spores were fumigated with 1.0% NO under 0.1% O_2 for 24 h at 25°C. Using a MOCON GreenLight™ rapid enumeration test system on wash-off samples of the corn kernels, the NO fumigation treatment was found to be effective in controlling microbes on *A. flavus* infected corn kernels. Unpasteurized almonds were fumigated with 0.1%, 0.3%, or 1.0% NO under ambient O_2 for different durations up to 7 days at 25°C. Rapid enumeration tests of wash-off solutions from the almond samples showed significantly reduced microbial loads and complete control of microbes for NO fumigation treatments depending on concentrations and treatment times. These results suggest that NO fumigation not only can control pests but also has potential to control microbes on stored products.