Abstract

[NOTE: This first paragraph is not part of abstract, but used to justify inclusion of poster under "Emerging issues". First impression of the title might lead one to place it in the topic area "Disinfestation and quarantine". However, the poster does not deal with modified atmospheres as a phytosanitary treatment, but the effect of modified atmospheric storage on ionizing irradiation phytosanitary treatments. As such, this poster is at the interface of two technologies that are growing in application]. Although it has been known for decades that hypoxia reduces the detrimental biological effects of irradiation, the effect of hypoxia on irradiation phytosanitary treatment efficacy has not been documented. This poster discusses the effects of hypoxia at the moment of irradiation on efficacy against four quarantine pests, plum curculio, apple maggot, oriental fruit moth, and European corn borer, and discusses ramifications for the application of irradiation phytosanitary treatments. The most radio tolerant stages of the four insects that could be found in shipped commodities were placed with host material in cylinders, some of which were purged with N_2 20h before irradiation, and held in that atmosphere for 1.5h after irradiation. The difference in efficacy between the insects irradiated under hypoxic or normal atmospheres was observed. Irradiation of apple maggot third instars in apples under hypoxia reduced adult emergence by an estimated 17%, which was statistically non-significant. Hypoxia more than doubled the irradiation dose required to prevent adult emergence of oriental fruit moth 5^{th} instars compared with normal atmospheres. However, the adults did not live very long and did not reproduce. Hypoxia doubled the dose required to prevent hatching of eggs laid by irradiated late European corn borer pupae. The dose to prevent reproduction of plum curculio adults under hypoxia was estimated to be twice that required under ambient atmospheres. Hypoxia may reduce the efficacy of irradiation phytosanitary treatments. Methods of reducing the effect of hypoxia may be devised. Instead of raising the irradiation dose, commodities could be irradiated before storage or after removal when the effect of hypoxia on any quarantine pests present has dissipated. On the other hand, hypoxia is studied as a possible phytosanitary treatment, but the oxygen level usually is lower and more strictly controlled than levels used for hypoxic storage. Still, hypoxia might provide some control, and that possibility should be factored into the phytosanitary risk analysis. In conclusion, irradiation as a phytosanitary treatment should not be used on commodities under hypoxic storage until the consequences have been adequately studied.