

INFLUENCE OF LOW OXYGEN CONDITIONS ON IRRADIATION AS A PHYTOSANITARY TREATMENT

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Ionizing irradiation can be used as a phytosanitary treatment to kill or sterilize invasive pests that arrive in imported agricultural products. Irradiation is a chemical free alternative to fumigation and the doses required to kill or sterilize pest species are well tolerated by many fresh fruit and vegetables. However, the irradiation of insects in anoxia is known to buffer the damaging effect of radiation when compared to the same radiation treatment applied under normal atmospheric conditions. Because commodities are often transported in low-oxygen environments, difficulty has arisen in developing a generic radiation dose for insect disinfestation under these conditions. Here, we examine the efficacy of irradiation as a treatment to induce sterility in the Cabbage Looper (*Trichoplusia ni*) exposed to a range of oxygen conditions. Female pharate adults (late pupae) were exposed to an oxygen condition (0, 5, 10, 15, 20.9 kPa) for 1 hr and then irradiated at one of five doses (0, 200, 400, 600, 800 Gy). Pupae irradiated at 200 Gy in anoxia had greater fertility as adults than those from other atmospheres. At 400 Gy, anoxia rescued fertility compared to pupae irradiated in oxygen atmospheres of 15 and 20.9 kPa. However, fertility did not differ among females that were irradiated as pupae in 0, 5 and 10 kPa O₂ or among 5, 10, 15 and 20.9 kPa O₂ treatments. This result suggests that irradiation in low oxygen conditions (5, 10 kPa) may provide some rescue effect, however on a smaller scale than occurs from irradiation in anoxia. Pharate pupae irradiated in anoxia at 600 and 800 Gy were far more likely to emerge as adult moths than pupae irradiated in oxygen conditions of 5 kPa or greater. However, for all atmospheric treatments, fertility was low at 600 Gy and total sterility occurred at 800 Gy.