RADIATION DOSES FOR QUARANTINE SECURITY AGAINST MEXICAN RICE BORER AND SUGARCANE BORER

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The Mexican rice borer, *Eoreuma loftini* (Dyar) (Lepidoptera: Pyralidae), is a stalk-boring insect which occurs in Texas and Mexico. This insect attacks sugarcane sorghum, corn, rice, wheat, oats, and wild grasses. The Sugarcane borer, *Diatraea saccharalis* (Fabr.) (Lepidoptera: Pyralidae), is also a stalk-boring insect of sugarcane, sorghum, corn, rice, and wild grasses occurring in the West Indies, the American tropics, Africa, Indonesia, and the southeastern U. S. from Texas to Florida. Both of these insects are quarantined by much of the rest of the world. Hallman & Chalot (1993) list three alternative quarantine treatments for sugarcane borer besides methyl bromide fumigation: -10°C for 48 hours, immersion in 52°C water for 20 minutes, and immersion in ambient (25°C) water for 72 hours. There are no quarantine treatments against the Mexican rice borer.

Ionizing radiation has shown promise as a quarantine treatment against insect pests for several decades, although it is only recently beginning to be used for modest amounts of fruit hosts of tephritid fruit flies shipped from Hawaii to the mainland United States of America (U. S.). Although considerable data has been generated concerning its efficacy against fruit flies, sufficient data is lacking to enable its use against many other important pest groups. Lepidopterous (moth) borers are an important group of quarantined pests which seem to be more tolerant of irradiation than important pest groups in Diptera (flies) and Coleoptera (beetles). More information is needed to be able to determine if irradiation will be a viable treatment against Lepidoptera. The objective of this study was to determine if irradiation could be used as a quarantine treatment against these two lepidopterous borers. The stages of these two borers that may infest shipped hosts, such as sugarcane stems, are larvae and pupae. The most developed stage present is usually the stage most tolerant to irradiation; therefore, late pupae will probably be the most tolerant stage.

Methodology. Both insects (late instar larvae and late pupae) were reared on meridic diets and irradiated in two Husman Model 521A (Isomedix) irradiators belonging to USDA, APHIS in Mission, TX. One delivers about 1/3 Gy/sec and the other about 2/3 Gy/sec using cesium 137. Routine dosimetry was done with Gafchromic film read with a spectrophotometer and compared with reference standard Fricke dosimetry performed when the irradiators were installed 13 and 2 years ago. After irradiation data were taken on adult emergence, longevity, and reproduction, and percentage egg hatch.

Results, Sugarcane Borer A dose of 100 Gy resulted in only 9% of the larvae pupating, and 75 Gy prevented emergence of normal-looking adults. A dose of 300 Gy applied to late pupae resulted in only 32% of the adults not emerging, while 17% of unirradiated pupae did not emerge.

Results, Mexican Rice Borer A dose of 150 Gy resulted in only 2% of the larvae pupating, and also prevented emergence of normal-looking adults. A dose of 300 Gy applied to late pupae did not reduce adult emergence, although there were about 2 and ½ times as many abnormal-looking adults as in the control. Longevity of adults from pupae irradiated at 300 Gy was somewhat less than unirradiated pupae, and they laid about 1/4 as many eggs. None of these eggs hatched, while egg hatch in the control was about 97%. Egg hatch from pupae irradiated with 250 Gy was 0.25%.

Discussion The Mexican rice borer was more tolerant of irradiation than the sugarcane borer. A dose of 300 Gy seems sufficient to prevent reproduction of Mexican rice borers irradiated as late pupae. Irradiation should not be used on plant cuttings which need to grow because irradiation inhibits plant growth and can cause mutations.

Reference Cited

Hallman, G. J. & D. S. Chalot. 1993. Possible quarantine treatments for Florida agricultural food commodities. Proc. Fla. State Hort. Soc. 106: 240-243.

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