POTENTIAL QUARANTINE TREATMENTS AGAINST PLUM CURCULIO TO REPLACE METHYL BROMIDE

Guy J. Hallman
USDA-ARS, Weslaco, Texas, USA

The plum curculio, *Conotrachelus nenuphar* (Herbst) (Coleoptera: Curculionidae) is native to North America east of the Rocky Mountains and north of latitude 28°N with one isolated infestation occurring in Utah. It has a wide host range which includes virtually all stone and pome fruits and blueberries. It could probably become adapted to the highland tropics as well as other temperate parts of the world and might possibly adapt to other fruits. Much of the world has quarantines against this insect, and methyl bromide fumigation is the primary disinfestation technique. A variety of cold temperature-time combinations lasting from 18-45 days are approved by different importing regulatory entities, but alternative treatments are needed. This paper presents results of ongoing research to develop quarantine treatments against plum curculio using extreme temperatures and controlled atmospheres. Results with irradiation are presented in another paper in this volume (Hallman 1998) and a paper presented last year (Hallman & Thomas 1997).

Controlled Atmospheres Plum curculio eggs, larvae, and adults in thinning apples were exposed to controlled atmospheres comprising 0.05 or 0.1% oxygen with or without 20% carbon dioxide with the remainder being nitrogen at 12 or 18°C. The number of days required to achieve 100% mortality of all stages at 12 and 18°C was >21 and about 15 days, respectively, regardless of the atmospheric combinations used, although there was considerable variation in the results. These temperatures resulted in slight mortality in the controls. Adults seemed to be easier to kill than immature stages.

Heat Adults and last instar larvae were subjected to heating at temperatures between 43 and 47°C in a hot water immersion bath to generate some basic information on their susceptibility to heat. Adults were immersed in stoppered copper tubes and did not come in contact with the water. Larvae were immersed in stainless steel mesh tea infusers placed directly in the water. Plum curculio larvae were immersed with Mexican fruit fly, *Anastrepha ludens* (Loew) larvae as a comparison because considerable is known about Mexican fruit fly larval tolerance to heat. Using the two different systems, 100% mortality was reached at about the same time for adults and larvae:

Temperature (°C):	43°	44°	45°	46°	47°
Time to 100% mortality, plum curculio (minutes):	140	90	60	40	15
Time to 100% mortality, Mexfly larvae (minutes):	110	90	50	40	10

Compared with the Mexican fruit fly, it appears that the plum curculio is more tolerant of heat.

Cold Experiments at 1°C did not show promise in reducing the length of time needed for cold treatment.

Discussion Of the quarantine treatments examined for plum curculio, irradiation seems to be the most promising from the standpoint of commodity quality and efficacy (Hallman 1998). A minimum absorbed dose of 92 Gy should provide quarantine security and will cause minimal damage to any of the pest's known host fruits. Heat and controlled atmospheres could probably be used as quarantine treatments under certain circumstances.

References Cited

Hallman, G. J. 1998. Radiation quarantine treatment for blueberries to replace methyl bromide. in: 1998 Ann. Internat. Res. Conf. on Methyl Bromide Alternatives and Emissions Reductions, Orlando.

Hallman, G. J. & D. B. Thomas. 1997. Irradiation quarantine treatment doses for apple maggot, blueberry maggot, and plum curculio. p. 78-1 to 2 in: 1997 Ann. Internat. Res. Conf. on Methyl Bromide Alternatives and Emissions Reduction, San Diego.

[Proc. 1998 Ann. Internat. Res. Conf. on Methyl Bromide Alternatives and Emissions Reductions, Orlando, FL, USA, Dec. 7-9]