

DEVELOPMENT OF NON-PHYTOTOXIC QUARANTINE TREATMENTS
FOR BARTLETT PEARS

New infestations of harmful tephritid fruit flies are a yearly occurrence in urban areas of California. Mediterranean, Oriental, and Caribbean fruit flies have all been trapped in the state in the recent past. These infestations point to the need for effective, non-phytotoxic quarantine treatments to control these insects in the event that they should invade major agricultural areas.

Our previous work on quarantine treatments for Bartlett pears has been largely devoted to a study of methyl bromide fumigation and ways to reduce phytotoxic responses of pears to this treatment. However, during the past two seasons, our emphasis has shifted to developing alternative treatments to fumigation, in an effort to find a physical treatment that would be effective against the various species of fruit flies and that would not cause injury or adversely affect the physiology of the fruit.

Our primary effort during the past season was directed toward developing or improving cold treatment schedules for control of the three fruit fly species listed above. Treatments approved by APHIS already exist for control of some fruit flies (Table 1). The minimal times and temperatures for control of fruit flies that have been approved by APHIS are 10 days at 32°F for Medfly and 14 days at 33°F for Caribbean fruit fly.

Table 1. Minimal times and temperatures for control of fruit flies.

Treatment	Medfly	Oriental	Caribbean
		Days/Temperature (°F)	
APHIS approved	10/32	--	14/33
Experimental	8/32 ^a	10/37 ^a	8+/31 ^a

^a Estimated populations too low to establish security.

Results of experiments on cold treatments of pears infested with the Caribbean fruit fly are shown in Table 2. A probit analysis of these data estimated that the probit-9 exposure at 31°F would be 8.3 days. Insect numbers on pears were small because these fruit do not appear to be a primary host for CFF. Pears break down rapidly at high temperatures and may not allow the insect time to complete development. The larvae that did emerge from the fruit seemed to be affected by the copious quantities of juice that collected in infested fruit.

Table 2. Survival of Caribbean fruit fly in pears stored at 5°C for indicated number of days (egg stage only). Data for 1984-85-86 combined.

Storage time (days)	Estimated treatment population	Number of survivors
4	12,953	611
5	10,234	186
6	12,902	39
7	14,226	4

9	2,569	0

Experiments on cold treatments of pears infested with Mediterranean or Oriental fruit flies were conducted at Hilo, Hawaii, and the results are summarized in Table 3 and 4, respectively. The data indicate that the number of days at 1°C required to disinfest pears is 8 days for MFF eggs, 9 days for MFF first instar larvae, 7 days for OFF eggs, and 8 days for OFF first instar larvae. After the cold treatments at 1°C are completed, additional tests will be conducted at 0 and -1°C. The results of all cold treatment tests will be used to develop a statistical model for the cold treatment of pears at temperatures ranging from -1 to +1°C. Research in Hawaii to complete the development of these cold treatments will be financed by USDA-ARS funds.

Table 3. Survival of Mediterranean fruit fly in pears stored at 1°C for indicated number of days.

Insect stage	Storage time (days)	Replications	Estimated treatment population	Number of survivors
Eggs	2	1	5	5
	3	1	223	53
	4	1	223	22
	5	3	914	42
	6	6	966	70
	7	8	3,020	3

	8	8	4,213	0
	9	7	4,095	0
	10	3	2,496	0
First instar larvae	4	2	285	19
	5	5	1,004	135
	6	4	808	139
	7	7	2,276	5
	8	7	2,756	3

	9	6	2,881	0
	10	3	1,331	0

Table 4. Survival of Oriental fruit fly in pears stored at 1°C for indicated number of days.

Insect stage	Storage time (days)	Replications	Estimated treatment population	Number of survivors
Eggs	2	2	870	62
	3	8	4,058	417
	4	8	3,934	119
	5	7	4,039	1
	6	8	2,413	5

	7	2	596	0
	8	1	35	0
First instar larvae	2	2	327	153
	3	8	5,659	246
	4	8	5,594	52
	5	8	5,520	19
	6	8	3,569	8
	7	2	553	4

	8	1	278	0