EXPLORATORY RESEARCH ON FREEZE TREATMENT FOR DISINFESTATION OF DATES

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The U.S. date industry faces a difficult juncture: Methyl bromide, the fumigant relied upon for postharvest disinfestation, will soon be completely banned; while, low temperature treatment, the most promising alternative, is only beginning to be explored. The present project focuses on freezing dates in bins as rapidly as possible on a scale suitable for all sizes of date handling operations. My approach is based upon the following propositions:

1) A treatment applied quicker is often more effective than the same treatment applied at a slower rate (Hallman, 1997).
2) The heating or cooling rate during research should not be faster than that possible commercially (ibid.).
3) Alternatives which are feasible only for large scale, capital-intensive agriculture are socially unjust and, therefore, by definition, unsustainable (UC-DANR, 1996).

Disinfestation, storage and shipping of the popular soft date variety, Medjool, at or near 0°F are common practices for two reasons: All life stages of dried-fruit beetles, the most troublesome Medjool pest, are quickly killed by low temperature (Navarro, 1989), and the fruit "sugars" (a form of granulosis) if not kept frozen shortly after picking and until just prior to retailing. However, in recent years, carob moth has severely infested the major U.S. variety, the semi-dry Deglet Noor, and longer exposure at or near 0°F will be required to kill this tenacious pest (Johnson, 1992). The California Date Administrative Committee has voted unanimously to request the help of the USDA in maintaining the use of methyl bromide on dried fruit.

Organic date packers are increasingly contracting cold storage companies to disinfest field-run dates. The most common method is room cooling at or near 0°F for 10 days. Limited space, time constraints, and high-energy consumption suggest the practicality and cost effectiveness of a *rapid* low temperature treatment which utilizes existing technology. Serpentine forced-air cooling is exactly such a method (Thompson, 1997); however, this method heretofore has been used only for cooling product above 32°F.

The first part of the project demonstrates cooling rates and temperatures commercially feasible (Tables 1 and 2). Follow-up laboratory research (simulation) involving live insects, especially carob moth, will be required to determine their effectiveness. The second part investigates the cost of rapid freezing.

Table 1. Temperature readings during Treatment 1 (control).

		TEMPERATURE (°F)		RUN TIME*	
DATE	TIME	AIR	PRODUCT	HRS	DAYS
1/22/98	13:00	0	90		
	14:30	10.0	90		
	15:00	8.1	90		
	18:00	5.8	82		
	23:00	5.5	78		
1/23/98	6:00	2.5	74	12	½
	12:00	3.7	66		
	18:00	0.2	60		
	23:00	–0.6	50		
1/24/98	6:00	–0.6	38	24	1
	12:00	–0.4	32		
	18:00	–0.2	28	36	1 ½
	23:00	–1.0	22		
1/25/98	6:00	–1.5	18	48	2
	12:00	–1.0	15		
	18:00	0	14	60	2 ½
	23:30	–0.8	12		
1/26/98	6:00	1.0	8	72	3
	12:00	0	8		
	23:00	–0.4	7		
1/27/98	6:00	–0.7	7	96	4
	18:00	0.5	5	108	4 ½
1/28/98	6:00	0.5	4	120	5
	18:00	0	4	132	5 ½

[*Starting at 82°F product temperature]

Treatment 1 quantifies what we know in general terms already:

> Those packing houses with cold storage facilities attempt to maintain a storage temperature of [0°F]. However during the harvest season the daily introduction of fresh material creates higher ambient temperatures within the cold chambers. Also the rate of penetration of cold into the date crates is relatively slow and the effectiveness of this method for insect control is still unclear (Navarro, ibid.).

Table 2. Temperature readings during Treatment 2.

DATE	TIME	TEMPERATURE (°F) AIR	PRODUCT	COMMENTS
5/2/99	9:10	1	82	Dates moved into freezer
	10:45	14	81	Blower turned on
	11:10	23	74	
	11:30	26	60	
	12:00	26	40	
	14:00	14	22	
	16:00	10	14	
	20:00	7	10	
	22:30	4	5	12 h run time
5/3/99	6:30	5	3	
	8:00	3	4	
	10:00	2	2	
	10:30	2	2	24 h “ “
	20:00	3	3	
	20:04			Blower turned off

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