lower than situations where centric populations (near center of high breeding, resting and feeding activity) prevail. Blowflies and flesh flies and *Atherigona* (Muscidae) were again found to be scarcely attracted to the sugar-toxicant formulation.

The efficacy of UC fly attractant and sugar-toxicant bait (Golden Malrin, containing 0.1% dichlorvos and 0.25% ronnel) was evaluated in 7-inch square aluminum pans filled with 600 gm soil dampened with 150 ml water. A small quantity of each formulation (2 gm of 50% UC fly attractant and 50% Golden Malrin, and 1 gm of 100% Golden Malrin, keeping toxicant concentration constant) was placed on top of the damp soil. Pairs of treated pans were set for four hours at various locations on a poultry ranch. The UC fly attractant formulation attracted much greater numbers of the false stable fly *Muscina stabulans* (Fallen) than the sugar-toxicant formulation alone (table 4). False stable flies occurred in large numbers in the tree shade during the period of this experiment.

Houseflies were also attracted in larger numbers to the attractant than the sugar-toxicant formulations. Houseflies prevailed more abundantly near the pig pen than in any of the other locations at the time the experiment was conducted. This could be due to the prevalence of physiological stages more responsive to the attractant in the area at that time of the day.

In another experiment at the same poultry ranch, empty pint- and quart-size juice cans, filled part way with damp vermiculite, were used as test units. The small survey units were suspended from ends of cage rows, while the larger quart-size units were placed on the floor at the ends of cage rows. About 2 gm of 50% UC fly attractant-50% Golden Malrin and 1 gm of the latter alone were placed in each unit. The toxicant concentration was thus kept the same for the two formulations.

The UC fly attractant formulation again attracted greater numbers of false stable flies and houseflies. The percentage of females attracted was also greater (table 5) in the units supplied with the attractant.

It has been observed that sugar-toxicant baits produce a good kill of centric populations of houseflies. A centric population is defined as one which is highly aggregated, and manifesting high activity and breeding potential in localized situations. Under these conditions the probability of random contact between flies and sugar bait is very high. On the other hand, pericentric flies away from their center of activity and breeding sites, respond quite differently to baits with and without attractants.

To document this phenomenon, sugar bait, with and without UC fly attractant, was placed on damp vermiculite kept in 1-gallon plastic jars suspended near horse corrals 100 m from a heavily fly-infested poultry ranch. The jar was provided with several 1-inch holes to facilitate entry of flies attracted. There was little or no breeding of flies in the horse corrals and most of the flies in the area flew out of the poultry ranch.

The units containing attractant were the only ones which attracted very large numbers of flies (table 6). The sugar-toxicant bait alone did not attract any appreciable number of flies. It is thus apparent that preclusion of physical contact with the sugar-toxicant bait renders these baits ineffective for the control of pericentric populations. Most of the rural and urban problems are caused by pericentric populations of flies, and sugar-toxicant baits without a tele-attractant will prove useless.

From these studies, it is concluded that UC fly attractant (prepared from putrefied proteinaceous materials) can provide a promising approach for behavioral control of synanthropic flies. Formulations containing this attractant, when used in large scale eye gnat control programs, have resulted in significant reduction of eye gnat populations in certain areas in the Coachella Valley. It also holds promise for the control of filth and flesh breeding flies prevailing at low to moderate levels of production under good farming management practices. Since this attractant is used as a spot-treatment, adverse environmental effects and hazards to natural enemies of flies in general, are greatly diminished. It is possible that the use of these tele-attractants, plus insecticides, will prolong the life expectancy of chemical control agents, such as dichlorvos, naled, trichlorfon, and many others, against pest flies.

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Watery breakdown of BARTLETT PEAR

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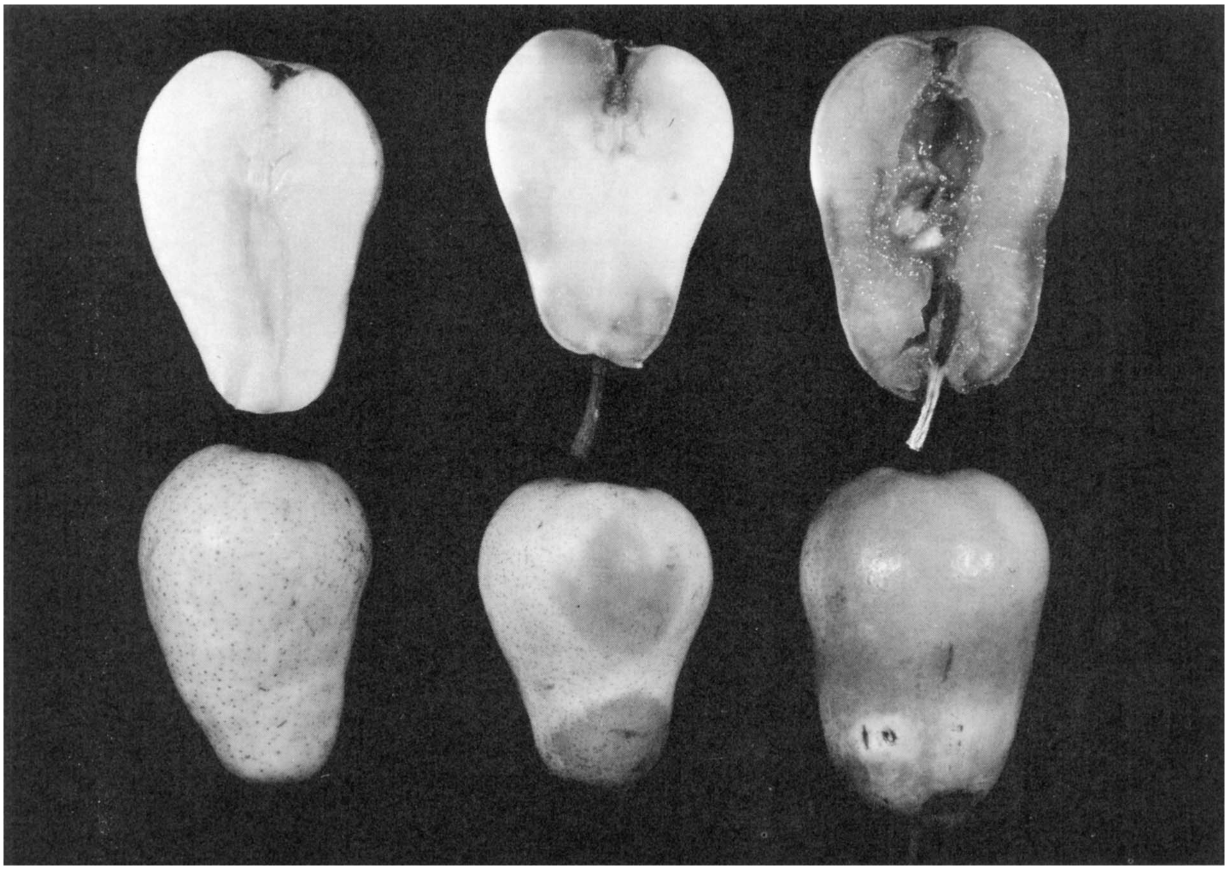
A senescent type of watery breakdown of Bartlett pears, comparable to one that had caused serious losses to processors in 1972, was induced in laboratory tests. Prompt, thorough cooling and low storage temperatures reduced the incidence of the disorder. Precise definition of temperature relationships and the possible effect of other seasonal, climatic, cultural or handling variations must await further studies. The methods and results reported here will provide guides to these studies.

BARTLETT PEAR processors sustained serious losses from a watery breakdown of fresh fruit during the 1972 season. This breakdown developed during



Internal and external symptoms of watery breakdown of Bartlett pears. Fruit to left is normal. Center fruit shows random nature of initial symptoms (note watersoaked appearance of affected tissue). Tissue of fruit on right is completely engrossed with watery breakdown. The breakdown shown here was induced in laboratory tests.

storage and ripening and was characterized by a soft, watery collapse that started at random and spread rapidly to the entire fruit flesh. When symptoms first appeared on the fruit surface, the core area was not necessarily affected. Processors reported that the greatest incidence of breakdown occurred with late-harvested fruit from any given district. The problem has reportedly been observed in past years, but its relationship to production areas or seasons is unclear.

The symptoms of the disorder are those of a senescent breakdown of the fruit flesh. Results of agar platings failed to implicate any microorganisms. Random measurements showed no correlation between soluble solids content of the fruit and incidence of the problem. The pattern of occurrence suggests some relationship of watery breakdown to handling and temperature management.

Late in the 1972 Bartlett pear harvest season, two tests were established to attempt to induce the disorder and to develop preliminary information on its relationship to handling and temperature management. Test 1 was a cooling test designed to evaluate the effect of cooling rate on incidence of watery breakdown. Test 2 was a storage test designed to evaluate the effect of delays before storage (resulting in partial flesh softening) and the effect of storage temperature on the incidence of watery breakdown.

Fruit was harvested in Lake County, California in late August. Fruit for the cooling test (test 1) was graded, transferred to Davis on the day of harvest, and separated into four lots which were cooled to 34°F in 4 hours, 3 days, 6 days and 10 days respectively. Following cooling, all lots were stored for 5 weeks at 30°F, then transferred to 68°F for ripening. Fruit for the storage test (test 2) had been promptly hydrocooled following harvest and held at 30°F for about one week before being obtained for the test (commercial harvest had been completed). On transfer to Davis, this fruit was warmed to 68°F, and each day during the next 5 days individual lots were moved to storage at 32°F and 36°F. After 1-month storage the fruit was transferred to 68°F for ripening. At time of transfer, and daily thereafter, fruits from both tests were evaluated for external symptoms of watery breakdown. Measurements of flesh firmness were made at the time of storage and upon removal from storage.

Test 1: cooling

Symptoms of watery breakdown were found only in the lot cooled over a 10-day period. The symptoms were judged comparable with those noted earlier on pears in processing channels. Treatment effects on firmness changes and incidence of watery breakdown are shown in table 1 (promptly cooled fruit was judged canning ripe in approximately 5 to 6 days).

TABLE 1. EFFECT OF SPEED OF COOLING ON FLESH FIRMNESS AND WATERY BREAKDOWN OF BARTLETT PEARS

Time to cool to 34°F	Firmness into storage (pounds)		Firmness out of storage (pounds)		Fruit breakdown after storage — Days of ripening at 68°F (per cent)						
	Avg.	Range	Avg.	Range	0	1	2	3	4	5	6
4 hours	15.7	(14–17.5)	15.1	(12–16.5)	0	0	0	0	0	0	0
3 days	14.7	(12–18)	12.0	(7–16.5)	0	0	0	0	0	0	0
6 days	13.1	(11.5–14.5)	10.5	(7–14)	0	0	0	0	0	0	1
10 days	4.3	(4–5)	3.0	(2.4–3.5)	4	5	7	12	37	75	96

TABLE 2. EFFECT OF DELAYED STORAGE ON FLESH FIRMNESS AND WATERY BREAKDOWN OF BARTLETT PEARS

FRUIT STORED AT 32°F

Time @ 68°F before storage (days)	Firmness into storage (pounds)		Firmness out of storage (pounds)		Fruit breakdown after storage — Days of ripening @ 68°F (per cent)						
	Avg.	Range	Avg.	Range	0	1	2	3	4	5	6
0	15.8	(12–19)	14.4	(11.5–8.5)	0	0	0	0	0	0	0
1	14.3	(12–17.5)	13.1	(10.5–16.5)	0	0	0	0	0	0	0
2	13.4	(4–16.5)	8.0	(4–11)	0	0	0	0	0	4	24
3	10.9	(7–16.5)	5.6	(3–11.5)	0	0	0	0	4	13	51
4	6.7	(4–12)	3.4	(2.5–4.5)	12	15	17	23	39	71	92
5	4.5	(3–12.5)	1.3	(0.5–3.5)	28	36	45	79	95	96	100

FRUIT STORED AT 36°F

Time @ 68°F before storage (days)	Firmness into storage (pounds)		Firmness out of storage (pounds)		Fruit breakdown after storage — Days of ripening @ 68°F (per cent)						
	Avg.	Range	Avg.	Range	0	1	2	3	4	5	6
0	15.8	(12–19)	10.2	(6–14.5)	0	0	0	0	0	8	47
1	14.3	(12–17.5)	11.0	(7–13.5)	0	0	0	0	0	4	23
2	13.4	(5–16.5)	8.8	(5–12)	0	0	0	0	3	8	44
3	10.9	(7–16.5)	4.1	(1.5–7)	5	16	32	49	61	85	100
4	6.7	(4–12)	3.7	(3–5)	5	12	20	53	67	87	100
5	4.5	(3–12.5)	2.0	(0.5–3.5)	40	51	64	81	95	96	100

Test 2: storage

Symptoms of watery breakdown were found in fruit from certain treatments, both at time of removal from storage, and after ripening at 68°F. These symptoms were judged to be like those noted earlier on fruit in processing channels. The incidence of watery breakdown was greater on fruit stored at 36°F than at 32°F, even when ripening differences were considered. Promptly stored fruit was judged canning-ripe in 5 to 6 days following 32°F holding temperature, and in 4 to 5 days following 36°F holding temperature. At either temperature, the development of watery breakdown was directly related to the length of storage delay, as shown in table 2.

The test results substantiate a relationship between temperature management and incidence of watery breakdown of late harvested Bartlett pears. Tests 1 and 2 demonstrated that symptoms of watery breakdown could be induced by slow cooling, or delays before cooling (either of which resulted in flesh softening). Test 2 also demonstrated a relationship between storage temperature and incidence of watery breakdown, with fruit stored at 36°F developing some breakdown during subsequent ripening even after prompt, thorough cooling.

These tests were intended as preliminary evaluations of procedures to induce the incidence of watery breakdown. They show an apparent benefit from prompt, thorough cooling and low storage temperatures. They do not show the effect of any factors other than cooling and storage on this deterioration problem. The possible relationship of fruit maturity, firmness at harvest, fruit injuries, seasonal or climatic variations, cultural or handling practices have not been determined. Further work is needed to more precisely define the relationship of handling and temperature management to this disorder. The methods and results reported here are intended as guides to further studies of the relationship of management techniques to this disorder.

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Economic

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Input-output analysis, long used by national planners, is being used by economists in California Cooperative Extension to help local governments develop economic information to aid in making resource planning decisions. As the name suggests, input-output analysis involves tracing the purchases (input) and production (output) of different sectors in an economy. Data are gathered on actual production and consumption relationships among the sectors. With this knowledge, an economic model of a selected area is created so that the effect of changes in any sector's production on all the other sectors can be measured. These models can and have been created on a national, state, regional, county and city basis.

THIS PROJECT began in 1965 in response to questions about agriculture's worth to a county's economy and the relationship of various forms of land use to a local economy. From the initial inquiries, other issues related to resource use, taxation, and employment evolved.

To date, the work has been concentrated in a five county area immediately north of the San Francisco Bay, and is now being extended to other counties. Analyses have been used in a variety of ways, primarily to estimate the economic impact of results of past, or anticipated, changes in resource use within a county.

The basic tool of analysis has been an input-output model utilizing a computerized combination of economic data from local sources and information synthesized from other studies. New economic