Artichoke Plume Moth Control

experiments and field practices during 1949–1957 show value of properly timed parathion treatments and good sanitation

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The artichoke plume moth—*Platyptilia carduidactyla* (Riley)—caused crop losses as high as 90% during 1956 and is the most important restricting factor in the production of artichokes.

Records kept in San Luis Obispo County—during a 14-year period—show that the artichoke plume moth has caused annual losses ranging from 10% to 90% with an average of 25%. Other counties report average seasonal losses of from 25% to 75%.

Artichokes planted in 1956—9,400 acres—had a fresh market value of $3,072,000 and the markets—for frozen artichoke hearts and for a new marinated product—will greatly increase the value of the crop in the next several years.

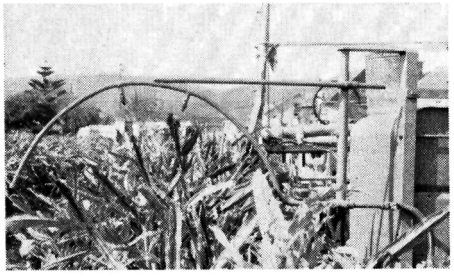
Factors responsible for severe infestations include continuous artichoke production on the same land, a tendency to grow the crop during the spring and summer months when the moth is very active, poor top disposal, and other poor sanitation practices.

The plume moth lays 70 to 300 eggs—with an average of 170 eggs—on the undersides of the woolly leaves of the artichoke plant. In the spring months they lay eggs also on the fuzzy stems below the buds. Eggs are rarely laid on the artichokes. The small worms hatch in from eight to 14 days and crawl to the bases of the shoots and feed upon the interfolded new leaves. If no bud is present they bore inside the stems. In the spring the young worms often enter upright buds and mine the outer bracts. Borings inside the stems or buds—black and filled with frass—are characteristic of the plume moth. Large worms may even enter the crowns of the plants.

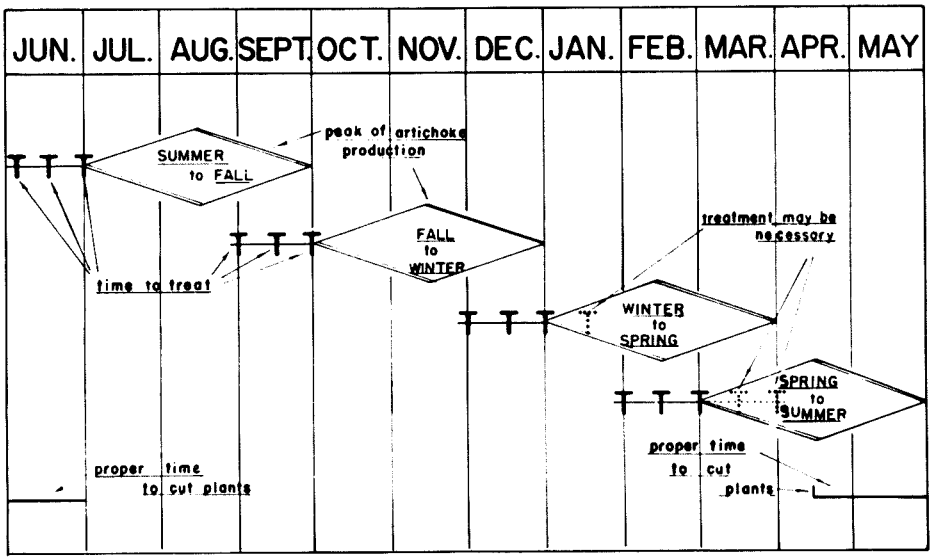
Larvae feed for 36 to 86 days. Pupation occurs in the stems, or on the outer bracts of the buds. Adults emerge 10 to 30 days later and may live for 30 days. A cycle from egg to adult may take from 54 to 140 days depending upon climatic conditions and the season of the year.

Three overlapping generations of the moth make it possible to find all stages of the plume moth every month of the year. If plants are cut off at or below the soil surface during April through June—the usual practice—the summer generation is distinct. The larvae of this generation attack the leaf petioles, often boring the entire length inside the stems because few buds are produced. The fall generation larvae enter buds as they appear at the bases of the shoots and cause damage until the following February. The spring generation starts the end of November and causes damage until the plants are cut again from April to June.

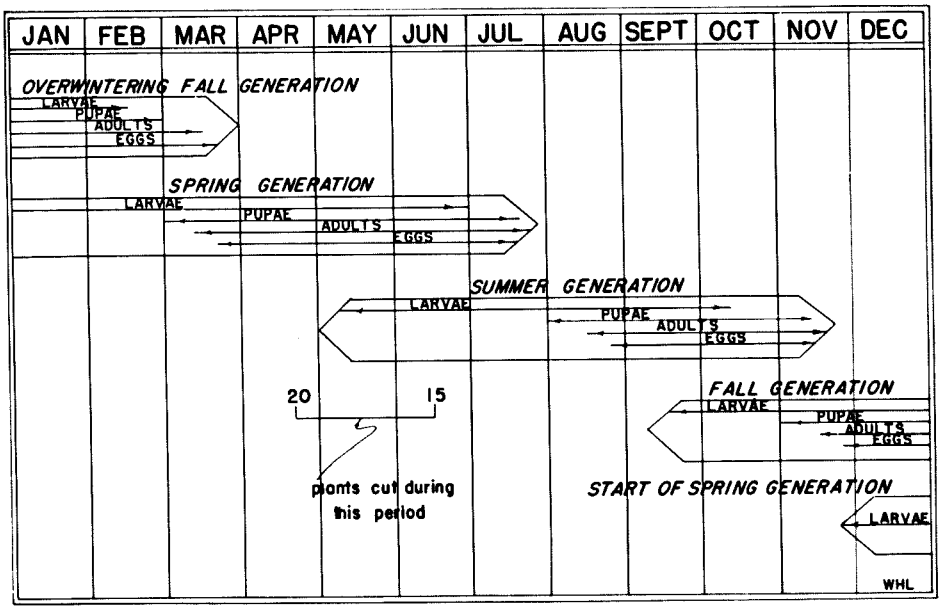
Power sprayer showing boom adaptation used to spray artichokes.



Timing of insecticide applications in relation to seasonal production of artichokes.



Seasonal cycle of the artichoke plume moth.



Experiments and commercial practice have demonstrated the value of parathion —dusts and sprays—for the control of the artichoke plume moth. Control is a matter of proper timing to correspond with the time of peak production of artichokes.

Three applications of parathion timed at 15–20-day intervals—15 to 60 days prior to peak production—are necessary for adequate control. Single applications applied at random intervals usually give only temporary control.

A peak in production during July to September requires three applications—about June 1, 15, and July 1. A peak crop during October to December requires treatment about September 1, 15, and October 1. A spring peak from March to May requires 3–5 applications starting about February 1.

Generations of the moth can be followed closely by watching brood development in cages or by counting the number of eggs per leaf. In San Luis Obispo County a count is made of 10 to 30 leaves cut midway between the oldest and newest leaves on the southeast side of the plants selected at random. Egg counts are usually correlated with current worminess in the fields and worminess 30–60 days following counts. For ex-

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Artichoke Production

costs and returns to growers studied in survey conducted at Half Moon Bay

Philip S. Parsons and R. H. Sciaroni

Producing artichokes in the Half Moon Bay area during the 1956–57 season cost $513.36 per acre—$2.20 per 22-pound box—according to information obtained in a recent survey.

The sample costs in Half Moon Bay are not presented as average for San Mateo County, however, because charges for individual items may vary in different plantings and increased yields would reduce per box costs. A yield of 225 boxes per acre—of 22 pounds each—is considered good but in some seasons yields may be much lower. Under ideal growing conditions a yield of 300 boxes per acre is possible.

To achieve good quality and high yields of artichokes an adequate fertilizer program and an economic control of the plume moth—the most important pest of artichokes—must be maintained consistently.

The cost of developing artichoke plants on the ranches surveyed came to $61.00 per acre which—spread over a five-year producing life—gives an annual cost of $12.20. Development costs include:

Make plants	15 man hrs.	$15.00
Planting	15 man hrs.	15.00
Truck	1.5 hrs.	3.00
Replant	3 man hrs.	3.00
Stumping, 1st year	5 man hrs.	5.00
Plants		20.00
		$61.00

Other costs were obtained from a number of growers during the survey and a sample schedule of work done, materials used, and prices as of 1956–57 was prepared as shown in the large table at the lower left.

Successful growers of artichokes must be skilled in the cultural and management phases of the enterprise because risk of crop failure—due to frost injury, heavy rainfall, and artichoke plume moth damage—is high in the production of artichokes.

Factors influencing net returns to growers are shown in the above single column table. A yield of 225 boxes per acre would require a seasonal average price of slightly more than $2.25 per box for the grower to break even with production costs.

Cost of Growing Artichokes in Half Moon Bay Area of San Mateo County Yield 4,950 lbs. or 225 (22 lbs.) boxes—1956–57

	Hours per acre				Costs per acre
	Man labor	30 H.P. track tr.	20 H.P. wheel tr.	Pickup truck	
Disk 2X before, 2X after plow	2.00	2.00			$ 7 00
Plow	1.25	1.25			4.38
Roll and ditch	1.00	1.00			3.50
Irrigate 9X, incl. moving pipe	45.00				45.00
Side dress	9.00	3.00			16.50
Cultivate with rows 7X	5.25		5.25		12.34
Cultivate across rows 2X	2.50		2.50		5.88
Hoe	5.00				5.00
Dust 8X (machine)	4.00		4.00		9.40
Pick, grade, pack and haul	58.00			9.00	76.00
Broadcast slug bait	1.50				1.50
Cut old growth, 2 men	1.50	.75			3.38
Burn old growth	5.00				5.00
Plow and ditch for drainage	1.75	1.75			6.13
Close ditch (plow)	1.25	1.25			4.38
Disk 2X harrow and roll	1.50	1.50			5.25
Misc. other labor	2.00	.50		.50	4.25
Total cultural and harvest labor costs	147.50	13.00	11.75	9.50	$214.89
Manure					25.00
Fertilizer, commercial					20.00
Dust, 400 lbs.					40.00
Slug bait					9.00
Boxes, nails and paper—33¢ per box					74.25
Irrigation water—power to pump					10.50
Total material cost					$178.75
General expense, taxes on plants and equipment, repairs, insurance					35.00
Land rent					50.00
Cash overhead costs					$ 85.00
Total cash costs					$478.64
Depreciation on tenant's field equipment					16.82
Depreciation of established artichokes, $61 with 5 year life					12.20
Interest on investment in tenant's field equipment					5.70
Total overhead costs					34.72
Total all costs except management					$513.36

Per Acre Net Returns from Artichockes in 1956–57 at Varying Levels of Yield, Cost and Price[1]

Yield /Acre. Boxes	Returns and Costs	Price/Box—22 lbs. $2.00	$2.25	$2.50	$2.75	$3.00
	Gross	$400	$450	$500	$550	$600
200	Costs	505	505	505	505	505
	Net	–105	– 55	– 5	45	95
	Gross	450	506	563	619	675
225	Costs	513	513	513	513	513
	Net	– 63	– 7	50	106	162
	Gross	500	563	625	688	750
250	Costs	521	521	521	521	521
	Net	– 21	42	104	167	229
	Gross	550	619	688	756	825
275	Costs	530	530	530	530	530
	Net	20	89	158	226	295
	Gross	600	675	750	825	900
300	Costs	538	538	538	538	538
	Net	62	137	212	287	362

[1] Variations in costs between various levels of yield caused by differences in harvest cost.

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ARTICHOKE

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ample: if the count shows up to 0.2 egg per leaf, there probably will be from 0% to 20% wormy artichokes; 0.2–0.5 egg per leaf, worminess up to 40%; and 0.5–1.7 eggs, worminess will be up to 80%.

An average artichoke crop will require 8–9 insecticide applications a year because production is usually not continuous. This frequency of treatment represents an expenditure of $40–$45 an acre for material, if dusts are used. Parathion is effective as it kills larvae by fumigant action. One application of one pound actual per acre kills 96%–100% of the larvae present on the plants.

Although both sprays and dusts are effective, dusts are more practical because power ground dusters are available. Usually 50 pounds of a 2% dust per acre is necessary. Parathion can be combined with 5% or 10% DDT to control other worms and insects on artichoke.

Full volume spray applications require one pound of actual parathion and 100–400 gallons of spray per acre.

Hand dusting has been extensively used in San Mateo County where growers have maintained worm damage below 5%. The dust is directed at the bases of the plants and residues on the buds are kept to a minimum.

Airplane applications have given control in Castroville tests, but four treatments by air are about equal to three by ground equipment. Residue and public health hazards often preclude the use of the airplane in certain areas.

In addition to parathion, dusts and sprays of guthion and chlorthion have given satisfactory control of the larvae in experimental plots in San Mateo and Monterey counties. Phosdrin was effective at rather high rates and dylox may have possibilities. Ryania was effective as hand applications, but ineffective with power equipment. Lindane spray and dusts gave good control, but were eliminated because of possible off-flavors.

Materials found of little value for economic commercial control include: malathion, diazinon, TEPP, dilan, perthane, nicotine, rotenone, pyrethrum, aldrin, dieldrin, heptachlor, endrin, DDT, isodrin, EPN, NPD, thimet, 6199, OMPA, demeton, 8305, sevin, and disyston. Some of these materials as full volume sprays—one-half gallon of spray per plant—gave control of worms.

Residues of parathion dusts and sprays on buds are not excessive. The outer foliage, however, may have 16–28 ppm—parts per million—after dusting or spraying, falling to 0.5–1.5 ppm in 7–10 days. Apparently the greatest hazard is involved in entering artichoke fields soon after applications are made. Therefore, a minimum period of 8–10 days should elapse before workers enter fields following parathion applications. Workers should wear protective clothing and utilize all the precautions specified by the manufacturers. Medical examinations at intervals may be necessary for workers having frequent exposure to parathion. Local agricultural authorities should be consulted before parathion treatments are applied.

Chemical Control Experiment—Half Moon Bay. Applied 100 gallons spray per acre on Nov. 16, 1956. Counted Nov. 30, 1956

Insecticide	Rate active ingredient per acre (pounds)	Average % kill of worms 14 days after treatment
Spray		
A—Parathion	1.0	100.0
B—Parathion	2.0	100.0
C—Guthion	2.0	77.8
D—Guthion	4.0	96.7
E—Thimet	1.0	4.0
F—Thimet	4.0	8.3
G—6199	0.38	6.7
H—OMPA	6.0	0.0
I—Systox	6.0	52.6
J—8305	4.0	70.0
K—Sevin	4.0	33.3
L—Phosdrin	4.0	100.0
Granules		
M—Disyston	2.0	3.3
Check		
N—No treatment		0.9

Results of Chemical Control Experiments for Control of the Artichoke Plume Moth, Half Moon Bay—1956*

Treatment	Ave. % shoots infested	Ave. number larvae per infested shoot	Ave. % reduction in larvae
A—Parathion 2% dust	0.94	0.75	88.4
B—Guthion 5% dust	0.00	0.00	100.0
C—Dylox 5% dust	1.88	0.75	76.8
D—Untreated	8.13	1.08	....

* Applied by power back duster on September 7, 22, and October 5, 1956, at 50 lbs. per acre per application; 4 replications to 84 plants per plot; examined 4 shoots per plant on 20 plants per plot, on November 10, 1956.

Proper disposal of cut artichoke tops. Above, making ditch; center, tops in ditch; below, covering.

Sanitation

Proper disposal of the tops at the time they are cut is necessary. Cutting with a blade, placing within a few days in a ditch and covering with at least 6″ of soil is the best method of top disposal. Chopping, disking, burning, and other methods simply allow more adults to emerge.

In certain areas air pollution control regulations may force discontinuance of the practice of burning the cut tops.

All wormy artichokes should be taken from the fields and utilized or destroyed, particularly in the spring of the year.

All thistles of the genus *Cirsium* and volunteer artichokes or cardoon should be removed because they harbor the plume moth.

A combination of good top disposal and chemical treatments makes possible adequate control of the artichoke plume moth.

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