AGRICULTURAL EXPERIMENT STATION
Oregon State College
Wm. A. Schoenfeld, Director
Corvallis

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THE CONTROL OF THE FILBERT MOTH

by
B. G. Thompson, Associate Entomologist

In 1929, the filbert moth Melissopus latiferreanus (Walslim) was found infesting filberts in Oregon. In 1930, the State Emergency Board allotted to the Oregon Experiment Station a small sum of money for the purpose of making a survey of the extent and damage caused by this insect to filberts. Infested nuts were found in every filbert growing section of the state. In most cases, the infestation was spotted and light.

Since 1930, the filbert moth has increased in numbers until in 1936 it was the limiting factor in filbert production in a number of orchards. In 1937, money was made available and the study of filbert insects begun.

Life History:

Before applied control tests can be intelligently undertaken, the life of the insect must be known. Considerable information was obtained on life history of the filbert moth by casual observations during the period 1930-1936. Detailed life history studies were undertaken in 1937 and continued through 1940. These studies indicate the life history of this moth on filberts to be as follows:

The adult moths begin emerging toward the end of June and emergence continues to about the 20th of July with an occasional straggler emerging during August.

The adult moths vary considerably in color, ranging from gray to almost red. They are about the size of a codling moth. The hind wings are almost black. Across each fore-wing are two golden bands, one near the middle and one near the apex. These bands have a metallic lustre giving them the appearance of hammered gold.

Mating takes places soon after emergence, and egg laying may begin the following day, if weather conditions are favorable. Moths are active only on warm, sunny days, and egg laying takes place during the hottest part of the day. The eggs are laid singly on the leaves with an occasional egg laid on the exposed portion of the nut.

The egg is a flattened, milky white disc about 1.6 mm in diameter. They hatch in from 6 to 9 days, under fair weather conditions.

The newly hatched larva moves about until a nut is located. Entrance is made through the basal scar. This is reached through a tunnel which is found in the soft portion of the husk next to the filbert shell. When the basal scar is

reached, the larva tunnels about until the mycropyle is located. The mycropyle is in the center of the basal scar and is much softer than the rest of the shell. Entrance to the nut is made through the mycropyle. Entrance is not always completed. Often the larvae perish before completing entrance and occasionally a larva will migrate to another nut.

On entering the nut, the larva begins to feed on the kernel. It may tunnel into the center of the kernel or excavate an irregular cavity in the side. The larvae become full grown about the time the nuts are ripe. On reaching maturity, the larvae usually leave the nut by enlarging the entrance hole in the mycropyle. In soft shelled varieties the exit hole is often made through the side of the nut. After leaving the nut, the larva enters the soil where a cocoon is spun in which to pass the winter. If a considerable amount of debris, leaves, etc., are on the ground, the cocoon may be constructed in this material. A part of the larvae spend the winter in the nuts.

The larvae change to pupae in the overwintering cocoons. Pupation usually takes place during the last week in May and the first half of June.

Parasites:

The egg parasite, Trichogramma evenscens (Westwood) is an important parasite of the filbert moth. During the past season, 15% of all the filbert moth eggs examined were destroyed by this parasite.

Control:

More than 15 different spray materials were tried out in our experimental spray plots. Of all these, a lead arsenate spray consisting of 3 pounds of lead arsenate, plus a spreader, and 100 gallons of water gave best control. Thoroughness of application is necessary. Both the upper and lower surfaces of the leaves, as well as the nut clusters, are thoroughly covered with the spray.

Calcium arsenate gave good control but caused serious foliage injury.

The summary of some of our experiments is given in the following table:

Material Used	Date Applied	Clean Nuts	Wormy Nuts	Per Cent Wormy Nuts
Calcium arsenate 3 lbs. to 100 gals.	7/24/37 8/11/37	8,168	274	3.2
Phenothiazine 3 lbs. to 100 gals.	7/24/37	5,094	388	7.1
Calcium arsenate 3 lbs. to 100 gals. and 4 oz. kayso	7/24/37	8,002	320	3.8
Calcium arsenate 3 lbs. to 100 gals. and 2 oz. blood meal	7/24/37	4,596	201	4.6

Material Used	Date Applied	Clean Nuts	Wormy Nuts	Per Cent Wormy Nuts
Calcium arsenate 3 lbs. and 4 oz. aresket	7/24/37	5,516	241	4.2
Lead arsenate 3 lbs. to 100 gals. and 4 oz. aresket	7/24/37	7,900	339	3.9
Lead arsenate 3 lbs. to 100 gals. and 2 oz. blood meal	7/24/37	4,708	201	4.5
Magnesium fluoride 3 lbs. to 100 gals.	8/11/37	13,294	488	3.5
Lead arsenate 3 lbs. to 100 gals. and soap spreader	8/11/37	9,854	99	.99
Barium fluoride 3 lbs. to 100 gals.	8/11/37	7,486	282	3.5
Calcium arsenate 3 lbs. to 100 gals. and 3% oil emulsion	8/12/37	7,786	216	2.7
Calcium arsenate 3 lbs. to 100 gals. and soap spreader	8/12/37	8,716	114	1.3
Kryocide 3 lbs.-100 gals.	8/12/37	2,653	273	10.3
Pyrethrum dust	8/3/37	2,852	552	16.2
Cubor 3/4% rotenone dust	8/3/37	8,620	818	8.6
Calcium arsenate and lime dust 15 to 85	8/3/37	8,830	582	6.1
Unsprayed check		2,332	771	23.3
Calcium arsenate 3 lbs. plus rosin residue spreader, 6 oz.	6/29/38	17,308	66	.49
Lead arsenate 3 lbs. to 100 gals. plus rosin residue, 3 oz.	6/29/38	10,728	13	.12
Calcium arsenate 3 lbs. to 100 gals. plus 8 oz. fish oil	7/12/38	12,238	49	.40
Unsprayed check		5,250	113	2.10
Calcium arsenate 3 lbs. to 100 gals. plus 4 oz. vatsol	7/12/38	12,193	73	.60
Lead arsenate, 3 lbs. to 100 gals. plus 8 oz. fish oil	7/12/38	19,694	222	1.12
Lead arsenate 3 lbs. to 100 gals. plus 4 oz. vatsol	7/12/38	6,094	92	1.49

Material Used	Date Applied	Clean Nuts	Wormy Nuts	Per Cent Wormy Nuts
Calcium arsenate 3 lbs. to 100 gals. plus vatsol, 4 oz.	7/12/38	10,627	108	1.01
Lead arsenate 3 lbs. to 100 gals. plus 4 oz. vatsol	7/21/38	8,745	73	.83
Stimtox (.05% pyrethrins)	7/21/38	8,866	111	1.23
Calcium arsenate 3 lbs. to 100 gals. plus 4 oz. vatsol	7/21/38	10,407	184	1.74
Potassium fluoride 3 lbs. to 100 gals.	7/21/38	7,387	97	1.28
Aluminum fluoride 3 lbs. to 100 gals.	7/21/38	10,687	360	3.26
Calcium fluoride 3 lbs. to 100 gals.	7/21/38	10,854	201	1.83
Calcium arsenate 3 lbs. to 100 gals. plus 4 oz. vatsol	7/26/38	8,910	173	1.91
Lead arsenate 3 lbs. to 100 gals. plus 4 oz. vatsol	7/26/38	11,336	83	.75
Calcium arsenate 3 lbs. to 100 gals.	6/29/38 7/26/38	4,992	4	.08
Lead arsenate 3 lbs. to 100 gals.	6/29/38 7/26/38	6,693	17	.26
Orchard near Springfield				
Lead arsenate	7/14/39	9,469	38	.41
Lead arsenate	7/14/39			
Two sprays	7/21/39	14,534	15	.10
Calcium arsenate	7/14/39	12,159	77	.62
Calcium arsenate	7/14/39			
Two sprays	7/29/39	12,773	48	.37
Check		10,990	162	1.45
Orchard in Polk County				
Copper arsenate	7/19/39	5,407	632	11.32
Lead arsenate	7/19/39	5,663	254	4.3
Check		8,068	432	4.09
Orchard in Marion County				
Unsprayed check		18,919	188	.98
Lead arsenate	7/13/39	21,324	165	.76
Copper arsenate	7/13/39	20,076	260	1.2
Orchard in Benton County				
Copper arsenate	7/23/39	12,036	26	.21
Check		9,502	74	.77