

# ORIENTAL FRUIT MOTH

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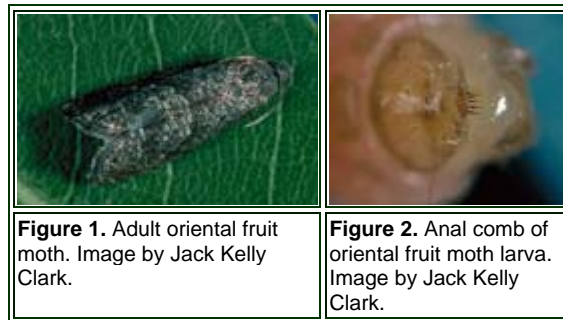
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The oriental fruit moth, *Grapholita molesta* (Busck), is a cosmopolitan pest that is present in major tree fruit production areas worldwide. It was inadvertently introduced into North America from Japan around 1913. Oriental fruit moth is an established pest of stone and pome fruit in most of the peach-growing areas of the United States. Oriental fruit moth attacks practically all orchard fruits, but is of particular importance as a pest of peach.

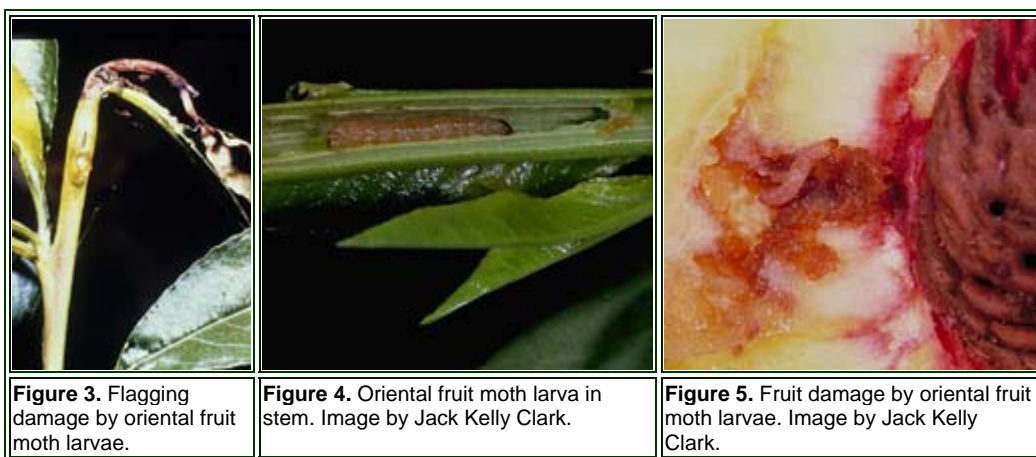
## DESCRIPTION

Moths are gray, about 1/4 inch (6-7 mm) long, with dark-brown bands on their wings (Figure 1). They have a wingspread of about 1/2 inch (12 mm). Larvae are pinkish-white, brown-headed caterpillars, about 1/2 inch (10-12 mm) long when fully grown, with a black anal comb on the top of their last body segment (Figure 2). Oriental fruit moth larvae have three pairs of true legs and fleshy prolegs on abdominal segments three, four, five, and six.



## PLANT INJURY

Oriental fruit moth's larval stages tunnel in succulent vegetative shoot growth or in fruit. Moths of the overwintered generation lay their eggs on succulent growth around bloom. Larvae burrow into tender, rapidly growing terminals. The larva enters a tender twig at a leaf axil near the tip, feeding down the central core of the shoot for two to six inches, resulting in wilting and death of the terminal, which is said to be "flagging" (Figure 3). Feeding patterns vary, an individual larva may attack only one terminal (Figure 4) or it may enter several stems or fruit to complete its development. When terminals are killed, lateral shoots are stimulated to develop below the dead area, so heavily infested trees may have a compact, bushy growth habit. Larvae of later generations may feed on terminals or peaches. Fruit feeding (Figure 5) increases dramatically as the season progresses, perhaps in response to hardening of terminal growth. Larvae attacking fruit often enter near the stem, leaving little or no external signs of entry. They also may enter where two peaches touch or from the side of an individual fruit. Tiny, dark spots exuding gum sometimes indicate larval entries. Once inside the fruit, larvae feed to the pit in a fashion similar to the plum curculio. The presence of distinct legs on oriental fruit moth caterpillars distinguishes them from legless plum curculio grubs. Oriental fruit moth larvae typically exit the peach through readily visible holes in the sides of fruit, from which considerable gum and dark frass may exude. Infested fruits break down rapidly and are unfit for consumption. In the Southeast, early- and even some mid-season cultivars may escape fruit damage by this pest. After harvest is complete, fruit moth larvae may again develop in the terminals if a late season vegetative growth flush is produced.



## SEASONAL HISTORY AND HABITS

The oriental fruit moth overwinters as a fully-grown larva in a silken cocoon on the tree, in a dried-up peach, in leaves or stems on the ground, or other protected sites such as stacked fruit bins. In the late winter, the larva transforms into a pupa and then to a moth. Oriental fruit moth adults typically begin to emerge shortly before peaches bloom. Emergence of the overwintering flight may continue for several weeks. After mating, female moths lay flat, whitish eggs on twigs or the underside of leaves near the tips of twigs. Normally, egg laying begins two to five days after adult females emerge. Adults live for about two weeks, during which time a female may lay up to 200 eggs. Cool temperatures may extend the egg stage to several weeks. Eggs hatch in less than a week in summer. First generation larvae primarily attack terminals. Larvae complete development in one to eight weeks, depending upon temperature, chewing their way out of the twig or fruit and spinning cocoons in which to pupate. Summer cocoons may be found in ground trash, under the bark on a tree, in the axils of leaves, or on fruit. The insect normally spends about two weeks in the cocoon before emerging as a moth.

There are six or more generations per year in central Georgia and five or more further north in Arkansas and North Carolina. Generational overlap, moths of two or more generations present at the same time, becomes more common as the season progresses.

## CONTROL

Optimal control of oriental fruit moth using conventional insecticides can be facilitated by monitoring moth activity with pheromone traps. First-brood fruit moths are normally controlled by insecticides applied for plum curculio. Adequate suppression of the first brood (adults developing from overwintered larvae) may give control for the entire season if orchards are not reinfested from untreated orchards nearby. The summer generations from May to mid-August can be controlled with insecticide applications or pheromone mating disruption. Mating disruption is most often employed by placing mating disruption dispensers in the orchard (ca. 100/acre) just before second flight begins. The dispenser saturates the orchard atmosphere with a volatile, synthetic mimic of the pheromone oriental fruit moth females produce to attract males. Saturating the orchard atmosphere with pheromone confuses the males, preventing mating and reproduction.

Timing management decisions for spraying or using mating disruption is best done by use of pheromone trap monitoring. At pink, set out three pheromone traps in each orchard. Check twice weekly for first catch of moths. On the first day moths are caught, begin accumulating daily degree-days (DD) using [Table 1](#). Locate the daily minimum temperature in the left column and move horizontally to the right until it intersects the vertical column below the daily maximum temperature. The value at this intersection (from 0 to 40) is the daily DD. Add DD values together daily until it totals 400 DD. At 400 DD, oriental fruit moth eggs have experienced enough warmth to begin hatching, and insecticides should be applied. Insecticides are required from 400 to 700 DD (typically April to May) to prevent infestation by oriental fruit moth larvae. The second oriental fruit moth generation hatches

between 1300 to 1700 DD (June), the third generation occurs from 2300 to 2700 DD (July) and overlaps with later generations until late September. Peaches should be sprayed to protect against oriental fruit moth hatch whenever 5 or more moths are caught per pheromone trap since the last insecticide application.

Good orchard sanitation is also important in reducing oriental fruit moth populations. Prompt removal and destruction of dropped and cull fruits from the orchard and packing shed destroy any larvae infesting these fruit. To the degree possible, all fruit should be removed at harvest. Unharvested and mummied fruit should be removed during pruning. Flailing of pruning debris helps reduce an orchard's overwintering oriental fruit moth population. Plant litter and other ground debris on the orchard floor should be kept to a minimum to reduce sites favorable for pupation and overwintering.

## REFERENCES

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- Pree, D. J., D. H. C. Herne, J. H. Phillips and W. P. Roberts. 1980.** Oriental fruit moth. Ontario Ministry of Agr. and Food Factsheet, 80-027. 4p.
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Table 1. Oriental fruit moth degree days (45°F lower base) at various daily maximum and minimum temperatures.

Max Min	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96
20	1	1	2	2	3	4	4	5	6	7	8	9	9	10	12	12	13	14	15	16	17	17	18	19
22	1	1	2	2	3	4	4	6	7	7	8	9	10	11	12	12	13	14	15	16	17	18	18	19
24	1	2	2	2	4	4	5	6	7	7	8	10	10	11	12	12	14	15	15	16	16	18	19	20
26	1	2	2	3	4	5	5	6	7	7	8	10	10	11	13	12	14	15	16	16	18	18	19	20
28	1	2	3	3	4	5	5	6	7	8	9	10	10	11	13	13	14	15	16	17	18	19	20	20
30	1	2	3	3	4	5	5	6	7	8	9	10	10	12	13	13	15	16	16	17	19	19	20	21
32	1	2	3	3	4	5	6	6	8	8	9	10	11	12	13	14	15	16	17	18	19	19	20	21
34	1	2	3	3	4	6	6	7	8	8	10	11	11	12	14	14	15	17	17	18	19	20	21	21
36	1	2	3	3	5	6	6	7	8	9	10	11	11	13	14	14	16	17	18	19	19	20	21	22
38	1	2	3	4	5	6	6	7	9	9	10	11	12	13	14	15	16	17	18	19	20	21	21	22
40	1	2	3	4	5	6	6	8	9	9	10	11	12	13	15	15	16	18	18	19	20	21	22	23
42	1	3	4	4	6	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
44	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
46	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
48	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
50	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
52	-	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
54	-	-	9	10	11	12	16	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
56	-	-	-	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
58	-	-	-	-	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
60	-	-	-	-	-	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
62	-	-	-	-	-	-	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
64	-	-	-	-	-	-	-	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
66	-	-	-	-	-	-	-	-	21	22	23	24	25	26	27	28	29	30	31	32	33	34	36	36
68	-	-	-	-	-	-	-	-	-	23	24	25	26	27	28	29	30	31	32	33	34	35	36	36
70	-	-	-	-	-	-	-	-	-	-	25	26	27	28	29	30	31	32	33	34	35	36	37	37
72	-	-	-	-	-	-	-	-	-	-	-	27	28	29	30	31	32	33	34	35	36	37	38	38
74	-	-	-	-	-	-	-	-	-	-	-	-	29	30	31	32	33	34	35	36	37	38	39	39
76	-	-	-	-	-	-	-	-	-	-	-	-	-	31	32	33	34	36	36	37	38	39	40	40