STUDIES ON THE CAUSE AND PREVENTION OF A PEACH DISEASE IN OKLAHOMA, KNOWN AS CATFACING

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About 1940, reports were received at the Oklahoma Agricultural Experiment Station of a peculiar type of damage to peach fruit known as catfacing. As this is known to be caused by the feeding of insects of a number of species, a cooperative project was set up between the Departments of Entomology and Horticulture, the object of which was to determine the cause of the disease and to devise methods of preventing it. The present paper is a report of progress and presents the results of experiments to determine the species and seasonal cycle of the insect causing the disease and when the injury is effected and of tests with insecticides to control it.

DESCRIPTION AND INCIDENCE OF THE DISEASE IN OKLAHOMA

A catfaced peach fruit shows from one to several deep indentations. The injury varies from a single slight puckering to several deep scars which may show corky tissue. Sometimes considerable areas are involved and the fruit is rendered worthless.

Because of the light peach crops the past two years, no figures could be obtained on the prevalence of the disease in Oklahoma. However, data are available for one orchard near Perkins. In 1943, 18 percent of the peaches were catfaced early in the season. There were but a few trees which bore fruit. In 1944, several thousand nearly ripe peaches were examined at this orchard in 14 varieties ripening from late May to October. There was a light crop on many of the varieties, while others were heavily fruited. An average of 4.8 per cent of the fruit was catfaced (Table I).

EFFECT OF FEEDING OF THE TARNISHED PLANT BUG ON PEACH FRUIT

The prevalence of the tarnished plant bug, *Lygus oblineatus* (Say), in the orchard indicated that this species might be responsible for the disease. To decide this point, several hundred branches bearing blooms in various stages of development were covered with cylindrical screen cages and two adult bugs introduced into each cage. They were left for an average period of four days, after which the cages were removed. The results are shown in Table II. On blooms or the young fruit before the shucks had begun to split the feeding of the insects blasted these forms and caused them to shed. The blooms seemed to be especially susceptible. If the bloom or young fruit survived, there was no more injury than found in the checks. After the shucks had split or had been shed, the feeding caused typical catfacing. It thus appears that the bugs blast the blooms at first and cause them to shed. Later when the young peach begins to emerge from the enveloping shuck, the feeding kills the cells in and around the feeding puncture but the rest of the peach grows. This uneven growth produces the malformity.

HOST PLANTS OF THE TARNISHED PLANT BUG

While the tarnished plant bug has been recorded as breeding on a wide range of wild and cultivated plants, periodic habitat collections at Perkins show that in 1944 it was mainly dependent upon four species: Two weeds, evening primrose (*Oenothera laciniata* Hill) and mare's-tail (*Erigeron canadensis* L.); and two leguminous crops, hairy vetch and alfalfa. The average

number of nymphs and adults collected on these hosts per 100 sweeps with a 12-inch insect net is shown in Table III. This species was dependent upon vetch and evening primrose from late April or before to early July, at which time these plants had matured. In June there was a shift to mare's-tail but this weed was not so attractive at this time as the other two. It served as a maintaining host through June and July until August when it became very attractive and was the principal host plant until fall. Alfalfa was important as a host plant but no records were taken when the first generation was developing. By the time the second growth of alfalfa became attractive in June, it was cut before the nymphs could complete their development. Nymphs were again collected from alfalfa from July 10 to August 18, by which date excessively hot weather had matured the crop and it had lost most of its leaves. Defoliation by the alfalfa webworm *(Loxostege similalis* (Guen.)) was also a contributing cause. Alfalfa was not suitable for oviposition during the rest of the season and no further breeding took place on this crop.

Collections made in cowpeas, sesbania, peanuts, sweet clover, and lespedeza showed either slight or no breeding and a comparatively small adult population (Table IV). One collection from soybeans showed that this crop might be attractive. Some breeding took place on pigweed *(Chenopodium* spp.) lamb's-quarters *(C. album* L.), heartsease *(Polygonum* spp.), and horse nettle *(Solanum carolinense* L.).

Early in the season primrose and vetch were about equally infested. Vetch later completely outstripped the primrose as an attractive food plant. By far the greatest amount of breeding took place on mare's-tail in August and September. Vetch was the most important in the study area because of the large number of plants available.

The reappearance of large numbers of these insects in alfalfa fields as soon as new growth developed indicates that the adult is migratory and is able to shift from an unfavorable environment to one that is favorable.

The rapid build-up in population in a field of mare's-tail in the late summer when other host plants were drying up or were being plowed under is also strongly suggestive of this habit.

During the early summer there were two well-defined periods when breeding was taking place, the peaks coming May 8 and June 9. The first two generations developed on vetch and evening primrose. There was also some second-generation development on mare's-tail. At least a third, and possibly a fourth, generation bred on mare's-tail and to some extent on alfalfa.

INSECTICIDE TESTS

Preliminary tests, chiefly of a laboratory nature, were made with a number of insecticides to determine their toxicity to tarnished plant bugs. A spray of nicotine sulfate (40 per cent) in water at a dilution of 1-800, in combination with wettable sulfur, 6 pounds, and lead arsenate, 3 pounds, to 100 gallons of water was ineffective. Sprays of nicotine sulfate (40 per cent) and a thiocyanate *(Lethane),* both at 1-400 dilution in water, caused approximately 50-per-cent mortality. A 1-per-cent-DDT aqueous spray and a 3-per-cent-DDT dust *(Gesarol 3A)* showed promise. Pyrethrum dust *(Pyrocide)* mixed with pyrophyllite so that the finished dust contained 1.25 per cent pyrethrins was less effective than the DDT treatment. An aqueous 10-per-cent-amorpha spray prepared from the extract of the seed of *Amorpha fruticosa* L. was ineffective. Also a standardized amorpha dust gave poor control. This was prepared from the extract of a given weight of seed im-

pregnated on the same weight of walnut-shell flour. Dusting sulfur, 325-mesh, was nontoxic.

SUMMARY

Catfacing, a malformation of peach fruit, was produced experimentally by caging adult tarnished plant bugs on young peaches after the shucks had split. The bugs also caused the blossoms to fall either before or after petal fall. They bred in herbaceous vegetation, primarily in hairy vetch, evening primrose, and mare's-tail. These plants occurred in succession thus enabling the insect to breed more or less continuously throughout much of the crop-growing season. Sprays of nicotine sulfate, amorpha, or thiocyanate, and a dust of 325-mesh sulfur undiluted except for conditioning, gave poor or no control. A 1-per-cent-DDT spray, a commercial 3-per-cent-DDT dust, and a pyrethrum dust containing 1.25 per cent pyrethrins showed promise.

TABLE I

Percentage of catfacing of peaches, Perkins, Oklahoma, 1944

Date of examination	Variety	Percentage of catfacing
May 24	Markgate	2
	Canadian Queen	2.5
June 15	David Globe	4.3
	Red Bird Cling	3
	May Flower	14
June 30	Early Rose	4.8
July 3	Early Rose	4
July 7	Carmen	3.5
	Rochester	6
July 13	Hale's Early	4
July 22	Elberta	7
	Early Elberta	3.5
August 10	Unknown	2.5
September 19	Heath Queen	6
October 9	Stimson	4.5
		Average 4.8

TABLE II

Effects of caging Lygus oblineatus *on peach blooms, Perkins, Oklahoma, 1943*

Stage of development	Percent of peaches remaining on tree	Percent of catfacing
Full bloom (check)	57	18
Full bloom	12	20
Petals fallen, stamens not wilted	31	19
Petals fallen, stamens dry	36	19
Shucks splitting	65	41
Shucks fallen	83	47.5

TABLE III

Average number of nymphs and adults of Lygus oblineatus *per collection on four host plants, Perkins, Oklahoma, 1944*

Month	Vetch		Primrose		Mare's-tail		Alfalfa	
	Nymphs	Adults	Nymphs	Adults	Nymphs	Adults	Nymphs	Adults
April-May	60.7	125	67.1	62.1	----	----	No record	
June	275.2	521.5	43.1	142.4	21.9	68.2	5.6	69.8
July	7	273.3	5	113.4	5	98.3	21.3	119.0
August	----	----	----	----	345.5	165.5	72.4	64.4
September	----	----	----	----	969.1	11,021.6	0	6.6
Oct.-Nov.	----	----	----	----	25.5	122.8	0	29.1

TABLE IV

Average number of nymphs and adults of Lygus oblineatus *per collection on 13 plant species, Perkins, Oklahoma, 1944*

Host plant	Period of collection	No. of collections	Nymphs	Adults
Cowpeas	June 29-August 31	16	1.9	13.1
Heartsease	July 25-August 31	11	9.5	20.7
Pigweed	July 25-July 27	2	43	55
Horse nettle	July 27-August 31	11	8.5	23.6
Ground cherry	July 27-Only	1	0	50
Soy bean	July 27-August 8	2	15	28
Tepary bean	July 27-September 5	10	1.4	2.8
Mung bean	July 27-September 5	10	0.4	7
Sesbania	July 27-September 5	10	0.2	5.2
Peanut	August 8-September 5	7	0.3	0
Sweet clover	August 18-October 16	8	0	2.5
Lamb's-quarters	August 22-October 16	6	0.3	41
Lespedeza	August 24-September 8	5	0	1.6