
Insects of Bur Oak Acorns¹

LESTER P. GIBSON

Forest Insect and Disease Laboratory, Northeastern Forest Experiment Station, Forest Service, USDA,
Delaware, Ohio 43015

ABSTRACT

During 1961–1969, the insects found damaging acorns of bur oak, *Quercus macrocarpa* Michauxii, in their order of importance were the weevils: *Curculio pardalis* (Chittenden), *C. strictus* (Casey), *C. sulcatulus* (Casey),

C. iowensis (Casey), *C. proboscideus* F., *C. confusor* (Hamilton), *Conotrachelus naso* LeConte, and *C. posticatus* Boheman; and the moth: *Melissopus latiferreanus* (Walsingham).

Acorns are essential to the propagation of oak trees, whether for forests or shade, and also are important as food for wildlife. But each year large quantities of acorns are destroyed by insects. The amount of insect damage, the insects responsible, and their relative importance were tabulated for various sites throughout the range of bur oak, *Quercus macrocarpa* Michx., from 1961 to 1969. The results of this study will allow future research to be concentrated on the species causing the most damage.

METHODS

Acorns, submitted by various collectors or collected

by me, were placed in emergence chambers, and the emergent larvae were sorted, counted, and placed in rearing containers. After most of the larvae had emerged, the acorns were opened and examined to determine their viability and the distribution of damage from all causes. The numbers of emergent larvae and those still in the acorns were combined to determine the total infestation.

The percentage distribution of species of *Conotrachelus* and *Curculio* was based on the adults that emerged. Thus a discrepancy in data could occur because of death or unequal parasitism of 1 or more species.

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RESULTS AND DISCUSSION

Many insect species were found in bur oak acorns. Most of these insects were secondary invaders, parasites, predators, casual visitors, or scavengers in either the larval or adult stage. The insects causing damage to bur oak acorns were species of Coleoptera, Lepidoptera, Diptera, and Hymenoptera.

Coleoptera of the genera *Conotrachelus* and *Curculio* usually caused most of the damage. Two species of *Conotrachelus*, *C. naso* LeConte and *C. posticus* Boheman, infest bur oak acorns (Gibson 1964). In samples from various parts of the bur oak range, *C. naso* averaged 67% and *C. posticus* 33% of the total population of *Conotrachelus* infesting bur oak acorns.

Five species of *Curculio* were reared from the 1961 to 1964 crops of bur oak acorns from the United States. Of these, *C. pardalis* (Chittenden) made up 66.74% of the total, *C. strictus* (Casey) 21.72%, *C. sulcatulus* (Casey) 9.80%, *C. proboscideus* F. 1.31%, and *C. confusor* (Hamilton)² 0.43%. Three species were reared from Canadian bur oak acorns; *C. iowensis* (Casey) made up 93.3% of the total, *C. confusor* was rarely found (0.2% in 1961 and 0.9% in 1962), and *C. strictus* made up the remainder.

The *Conotrachelus* and *Curculio* usually averaged more than 1 mature larva/infested nut. Each *Curculio* larva usually chewed its own exit hole, and up to 14 individual holes were made in a single nut. *Conotrachelus* larvae usually exited through previously made holes or through a crack in the nutshell.

The *Curculio* larvae varied from 1 to 18, *Conotrachelus* larvae from 1 to 8, and Lepidoptera larvae from 1 to 2/infested nut. It was not uncommon to find larvae of *Curculio*, *Conotrachelus*, Lepidoptera, and Hymenoptera in the same nut.

All other Coleoptera found in the acorns were secondary invaders: species of Staphylinidae, Dermestidae, Elateridae, Nitidulidae, Mycetophagidae, Bostriichidae, Curculionidae, and Scolytidae; and predators: species of Staphylinidae, Carabidae, and Histeridae.

Three categories of Lepidoptera were found in bur oak acorns: (1) visitors such as *Moodna ostrinella* (Clemens), which sometimes pupated in the nut after gaining entrance through an exit hole made by other insects; (2) the scavenger, *Valentinia glandulella* (Riley), which gained entrance through the oviposition or exit hole of another insect or through a mechanical wound; and (3) the primary invader, *Melissopus latiferrcanus* (Walsingham).

M. latiferrcanus usually oviposited through the bottom of the cup while the nut was still forming. The resultant larva sometimes completely consumed the nutmeat but rarely moved to adjacent nuts before completing its growth. Pupation normally took place in the leaves and other debris on the ground. Infestation of bur oak acorns by this species rarely exceeded 4% of the mature crop, but did run as high

Table 1.—Conditions of bur oak acorns (%).

Locality	Sound	Insect damaged	Rotten	Mal-formed
1961				
Plain City, Ohio	45.0	44.3	8.6	2.1
Watkins, Ohio	12.3	78.3	0	9.4
Worthington, Ohio	62.7	27.5	4.9	4.9
1962				
Plain City, Ohio	55.6	27.7	16.7	0
Watkins, Ohio	14.0	48.8	7.0	30.2
Worthington, Ohio	46.0	38.0	16.0	0
Norton, Ohio	3.5	96.5	0	0
Ottawa, Ohio	55.4	29.3	8.3	7.0
East Harbor, Ohio	47.6	37.8	4.6	0
Lake Loramie, Ohio	3.8	88.6	5.7	1.9
Wapakoneta, Ohio	9.1	90.9	0	0
LaCrosse, Wis.	68.2	29.4	0.8	1.6
Bourbon, Ky.	25.6	38.1	16.3	20.0
1963				
Ottawa, Ohio	74.0	6.0	20.0	0
East Harbor, Ohio	74.0	16.0	9.0	1.0
Wapakoneta, Ohio	47.0	51.0	2.0	0
Marion, Ohio	67.0	7.0	25.0	1.0
Lisle, Ill.	22.0	71.0	7.0	0
Davenport, Iowa (a)	50.0	45.0	4.0	1.0
Davenport, Iowa (b)	65.0	32.0	3.0	0
Amana, Iowa	31.0	53.0	16.0	0
Madison, Wis.	71.0	25.0	4.0	0
Victeur, Que.	34.0	41.0	25.0	0
Berthier Co., Que.	20.0	45.0	28.0	7.0
Napanee, Ont.	0	30.0	70.0	0
Bameland, Ont.	38.0	46.0	16.0	0
Niagara Falls, Ont.	28.0	6.0	66.0	0
Minnedosa, Man.	31.0	53.0	12.0	4.0
Ft. Garry, Man.	15.0	69.0	16.0	0
Winnipeg, Man.	81.0	6.0	13.0	0
1964				
Plain City, Ohio	39.0	61.0	0	0
Watkins, Ohio	31.0	54.0	3.0	12.0
Norton, Ohio	40.0	60.0	0	0
Marion, Ohio	49.0	43.0	7.0	1.0
East Harbor, Ohio	67.0	32.0	1.0	0
Wapakoneta, Ohio	68.0	32.0	0	0

as 10%. The amount of damage to immature nuts was not determined.

V. glandulella frequently pupated in the nut after feeding on the frass and detritus left by weevils or by *M. latiferrcanus*. *V. glandulella* in some instances was detrimental to the acorn crop. Nuts infested by *Curculio* might not be completely eaten, and thus they remained viable and capable of producing a seedling. The moth larva, in its foraging, usually consumed the remaining nutmeat, rendering the nut nonviable.

The Diptera that affect bur oak acorns were represented by parasites of Lepidoptera and by secondary invaders, such as Drosophilidae and Mycetophilidae, that fed on the decaying fungus-infected nut or on the residue of frass and detritus left by Lepidoptera and Coleoptera. A few Diptera species may cause damage to acorns, but they are not considered important to seed viability.

Two kinds of Cynipidae were found causing damage to acorns. The wasps laid eggs in the pistillate

² All *Curculio* species names conform to the recent revision by Gibson (1969).

Table 2.—Percent insect-damaged and sound bur oak acorns from 1961 to 1964 when acorn crops were light, medium, and heavy (several localities in Ohio).

Crop light		Crop medium		Crop heavy	
Dam- aged	Sound	Dam- aged	Sound	Dam- aged	Sound
27.5	62.7	78.3	12.3	44.3	45.0
27.7	55.6	48.8	14.0	90.9	9.1
38.0	46.0	29.3	55.4	96.5	3.5
7.0	67.0	88.6	3.8	37.8	57.6
32.0	68.0	6.0	74.0	61.0	39.0
16.0	74.0	60.0	40.0	54.0	31.0
		32.0	67.0		
		43.0	49.0		
Averages					
24.70	62.22	48.56	40.28	64.08	30.87

flowers, and galls developed in the acorn or on the acorn cup. *Cynips glandulosus* Beutenmueller produced growths resembling small acorns on the side of the acorn cup. These galls did not usually affect acorn viability. The 2nd kind of galls, which were seldom found, were caused by *Callirhytis* sp. The galls formed as a group of separate but appressed cells imbedded in, but separate from, the flesh of the cotyledon. They detracted very little from the nutmeat and did not affect the viability of the acorn.

Other Hymenoptera found in acorns were chalcidoid parasites of the cynipids or ichneumonid parasites of the Lepidoptera.

The degree of infestation varied from year to year and from tree to tree in the same area as well as throughout the range of bur oak. Therefore, the data presented in Table 1 are actually indicative only of the infestation of each tree. But they do give an indication of the density and diversity of insect damage to bur oak acorns.

Samples from 3 Ohio localities during 1961 varied from 12.3 to 62.7% sound and from 27.5 to 78.3% insect damaged. The infestations consisted of 96.1% *Curculio* spp., 2.8% *Conotrachelus* spp., 1.1% Lepidoptera, and no galls.

Samples from throughout the range of bur oak during 1962 varied from 3.8 to 68.2% sound and from 29.4 to 90.9% insect damaged. The infestations consisted of 93.9% *Curculio* spp., 2.9% *Conotrachelus* spp., 3.2% Lepidoptera, and no galls.

Samples from throughout the range of bur oak during 1963 varied from 0 to 81% sound and from 6 to 71% insect damaged. The infestations consisted of 86.0% *Curculio* spp., 8.5% *Conotrachelus* spp., 3.3% Lepidoptera, and 2.2% galls.

Beal (1952) observed that light crops of acorns usually were more heavily infested than heavy crops. This observation was not found to hold for bur oak (Table 2). In fact, I found that the heavier the crop, the higher the percent of insect damage. The average percent sound acorns per year stayed fairly constant as exemplified by records during 1961–1964 (1961, 40%; 1962, 34%; 1963, 43%; 1964, 49%), but the percent insect damaged fluctuated with crop size.

In 1963, few bur oak acorns were produced in Ohio because of inclement weather at the time of flowering. The percent of insect-damaged acorns was also low that year (35% compared to 50% in 1961, 53% in 1962, and 47% in 1964).

During attempts to collect adult weevils, I found that few if any weevils could be taken from non-bearing trees whereas weevils could be taken from nearby nut-bearing trees. This observation, along with the infestation data, indicates that there is probably some type of attractant response of the weevil to the acorns themselves.

REFERENCES CITED

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