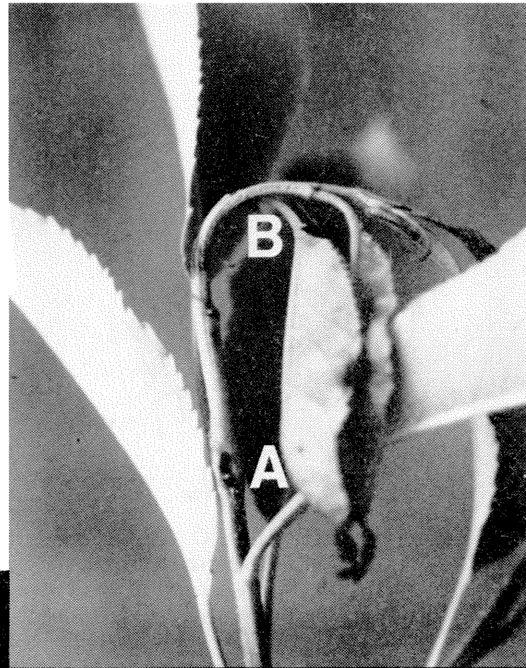
ODC 145.7 x 416.1: 176.1 *Prunus serotina* Ehrh.



STEM DEFORMITY IN BLACK CHERRY

by Charles O. Rexrode

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Abstract

A 2-year study of stem deformity in black cherry on the Allegheny and Monongahela National Forests revealed that insects, disease, frost, and browsing by deer were the major sources of injury to the terminal shoots of seedlings and saplings. Twenty-seven species of insects from 19 families and 5 orders were associated with young black cherry trees. Of these species, *Archips* sp., and *Cecidomyia serotinae* O.S., caused the most stem deformity. The percentage of trees damaged by these two species of insects ranged from 0 to 43 *on six study areas* during 1976-77. Damage from black knot disease, *Apiosorina morbosa,* averaged about 3 percent. Frost injury was the primary cause of stem deformity in black cherry on the Monongahela National Forest during both years of the study.

INTRODUCTION

ON AN INDIVIDUAL-TREE BASIS, black cherry, *Prunus serotina* Ehrh., is second only to black walnut in timber value in the United States. In parts of Pennsylvania and West Virginia, black cherry is the most important species. However, in these two states there are large numbers of black cherry seedlings and saplings with a forked or crooked main stem. This results in pole stands with a high proportion of deformed trees, and a consequent reduction in timber value, so forest managers have emphasized higher quality through the selection and breeding of better stock. But many young plantations are low in quality because of poor growth and form, and many established plantations have saplings with a forked main stem. Also, seedlings have been planted on sites where the soil and vegetation are not conducive to vigorous growth.

Regardless of site condition, black cherry seedlings and saplings are damaged by frost, mammals, disease, and insects. Insects are suspected as a major source of damage to seedlings and saplings—even on the better sites. In this study I wanted to identify these insects and other major sources of injury which may result in deformity in black cherry.

METHODS

This study was conducted during the summers of 1976 and 1977 on the Allegheny National Forest in Pennsylvania, and on the Monongahela National Forest in West Virginia. Six areas of black cherry reproduction were selected; five were on the Allegheny and one was on the Monongahela. Study areas ranged in size from 2 to 20 acres, and 10 plots of approximately 20 trees each were established in each area. The trees ranged in height from 2 to 10 feet. Three of the study areas were part of a tree improvement study by the Eastern Region of the Forest Service, and were enclosed by a 10-foot-high fence.

Before cherry buds were completely open (early spring), some of the buds that exhibited insect entrance holes, failed to expand, or showed other damage were collected and dissected. The remaining damaged or abnormal buds, shoots, and stems were left intact for later evaluation. Some of the insects observed feeding on or within buds, shoots, and stems were collected and identified. A correlation was made between damage by specific insects and resulting tree injury.

Insects also were collected and identified monthly—from April through August in each area. During August of each year, the amount and type of damage from insects and other major sources of injury was determined for each study area.

RESULTS AND DISCUSSION

Insects, disease, frost, and browsing by deer were the major sources of injury to terminal shoots which resulted in stem deformity (Table 1). Twenty-seven species of insects from 19 families and 5 orders were associated with young black cherry trees (Table 2). However, of these species, a tortricid, *Archips* sp., and a gall midge, *Cecidomyia serotinae* O.S., caused the most stem deformity in black cherry.

The tortricid larvae enter developing shoots (Fig. 1) in late April and burrow upward for approximately 3 weeks; after this period, the larvae probably migrate to mature leaves on the same tree and resume feeding. The damaged terminal shoot takes on a wilted appearance in early May (Fig. 1). By the middle of the month, the shoot resembles one that has been damaged by frost (Figs. 2 and 3). The damaged shoot usually dies, and the function of the terminal is assumed by shoots that develop at a point lower than the apex of the original shoot, thus resulting in a deformed tree (Fig. 4). Tortricids accounted for 0 to 36 percent of the deformed stems on the study areas (Table 1).

Gall midge attack was evident on terminal shoots by mid-July. The terminal shoot or bud develops into an oval swelling about ½-inch in diameter; the swelling contains yellowish-orange maggots (Fig. 5). By late August, branches 1 to 2 inches long develop on and around many galls

Table 1.—Percentage of black cherry trees deformed on the Allegheny and Monongahela National Forests in 1976-77, by major source of damage.

Area	No. trees observed	Year	Tortricid	Gall midge	Black knot disease	Frost	Deer	Other	Total
Progeny test 1	400	1976	10	8	3	4	0	5[a]	31
	185	1977	36	7	2	0	0	2	48
Progeny test 2	200	1976	4	0	0	7	0	5	17
	200	1977	15	2	0	9	0	23[b]	50
Progeny test 3	330	1976	3	0	5	56	0	5	69
(Monongahela)	200	1977	4	0	4	62	0	5	76
Fertilized	200	1976	7	43	1	7	0	2	62
	200	1977	4	29	0	0	0	4	38
Natural stand	400	1976	0	1	1	10	3	2	19
	200	1977	29	0	1	2	7	0	40
Plantation	200	1976	0	5	0	0	90	0	95
(each tree fenced)	166	1977	0	2	0	0	83	0	85

[a]Lateral branch became dominant but main stem remained healthy.
[b]Mechanical damage due to plantation cleaning.

Table 2.—Insects collected from young black cherry trees in Pennsylvania and West Virginia, 1976-77.

Order	Family	Species
Coleoptera	Cantharidae	*Cantharis* sp.
	Cerambycidae	*Oncideres* sp.
	Chrysomelidae	*Orsodacne atra* (Ahrens)
		Paria quadriguttata LeC.
		Scelolyperus cyanellus (LeC.)
	Curculionidae	*Auletobius albovestitus* (Blatchley)
		Phyllobius oblongus (L.)
		Rhynchaenus canus (Horn)
	Elateridae	*Ampedus* sp.
		Ctenicera tarsalis (Melsh)
		Dalopius sp.
	Helodidae	*Cyphon ruficollis* Say
	Lagriidae	*Arthromacra aenea aenea* (Say)
	Melandryidae	*Symphora flavicollis* Haldeman
	Scarabaeidae	*Dichelonyx linearis* (Gyll.)
Diptera	Cecidomyiidae	*Cecidomyia serotinae* O. S.
Hemiptera-Heteroptera	Tingidae	*Corythucha* sp. Osborn and Droke
Hymenoptera	Cimbicidae	*Trichiosoma triangulum* Kirby
Lepidoptera	Coleophoridae	*Coleophora malivorella* Riley
	Geometridae	*Alsophila pometaria* (Harris)
		Calocalpe prunivorata Ferguson
		Phigalia titea (Cramer)
	Lasiocampidae	*Malacosoma americanum* (F.)
	Noctuidae	*Orthosia hibisci* (Guenee)
	Psychidae	*Fumaria casta* (Pallas)
	Tortricidae	*Archips* sp.
	Yponomeutidae	*Argyresthia* sp.

(Fig. 6). These branches continue to develop during the following year (Fig. 7), forming a tree with multiple terminal shoots (Fig. 8). The gall midge accounted for 0 to 43 percent of the deformity on the six study areas (Table 1).

Black knot disease, *A. morbosa,* was usually present but it accounted for little deformity (Table 1). Tumorlike cankers typical of this disease usually weaken and kill the affected terminal within a few years (Fig. 9).

Frost injury (Fig. 10) was the primary cause of stem deformity in black cherry on the Monongahela National Forest during both years of the study (Table 1). In some cases, 2 years of terminal growth was killed.

Browsing by deer is a serious threat to black cherry in areas on the Allegheny National Forest where the trees are not protected. In fact, in one area where each tree was enclosed by a 4-foot-high fence, 90 percent of the trees had terminal damage (Table 1). Terminal injury by deer is characterized by a breaking or tearing of the terminal during removal (Figs. 11 and 12).

The problem of stem deformity is a complex one where black cherry is grown in monoculture because of the variety of agents that injure the shoots. In some areas of Pennsylvania, browsing by deer is the most serious difficulty in regenerating black cherry. But even in the absence of deer, stem deformity caused by insects alone is serious.

Another complication is that, although damage may be found in less than 20 percent of the trees in a plantation on any year, the damage to shoots is compounded within the plantation over a period of years. In theory, when 20 percent of the trees are deformed each year, every tree in a plantation could be affected in five growing seasons. Also, the insects that cause the deformity have different habits and life cycles, thus making control difficult. However, once the feeding and development habits of these insects are known, stem deformity can be prevented by cultural or chemical control techniques.

Until more is known about the insects that cause deformity in black cherry, each plantation will have to be evaluated independently by the forest manager and the entomologist. Both must assess each insect infestation as to condition and long-range objectives of the plantation. For example, in the fertilized study area, the gall midge damaged 43 percent of the trees in 1976, and 29 percent in 1977 (Table 1). This amount of damage may be of less concern to a forester than an entomologist because the density of stocking is several thousand trees per acre, many more than are needed for a final crop. Also, the trees are growing at a rate of 3 to 4 feet a year, so they will not remain susceptible to injury for long.

In the meantime, if black cherry is grown in monoculture, good tree vigor should be maintained, thus favoring rapid shoot elongation. Also, sufficient stocking should be maintained so that deformed trees can be removed during early thinning.

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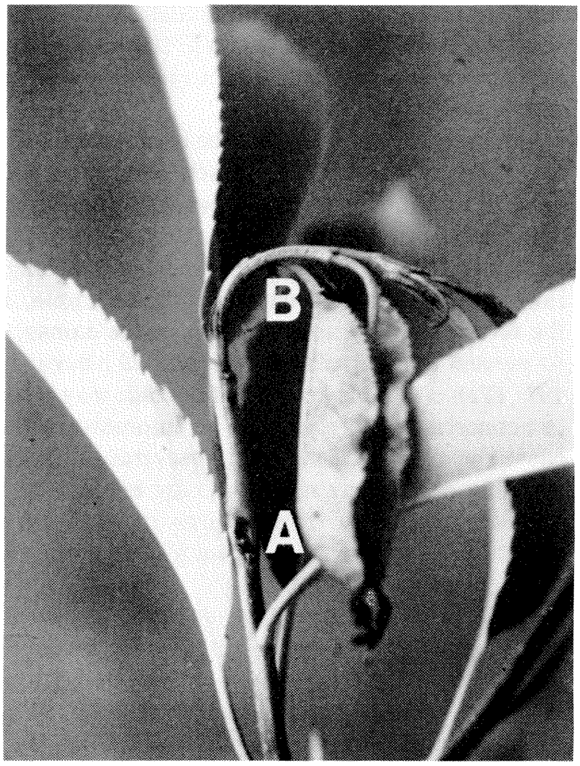

Figure 1.—*Archips* entrance hole on developing shoots (A), and wilting shoot (B).

Figure 2.—Late symptoms of *Archips* attack.

Figure 3.—*Archips* damage: brown and wilted terminal (A); larva (B); larval entrance (C); and exit holes (D).

Figure 4.—Deformed tree—injury caused by *Archips*.

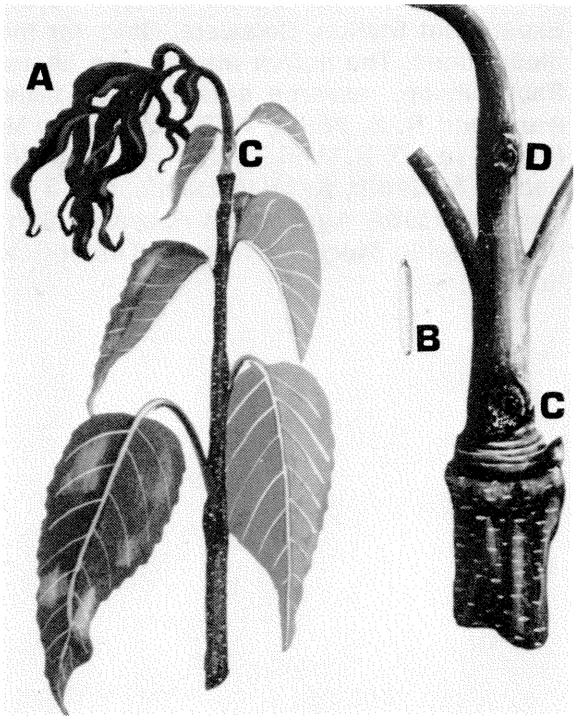

Figure 5.—Stem gall caused by *C. serotinae.*

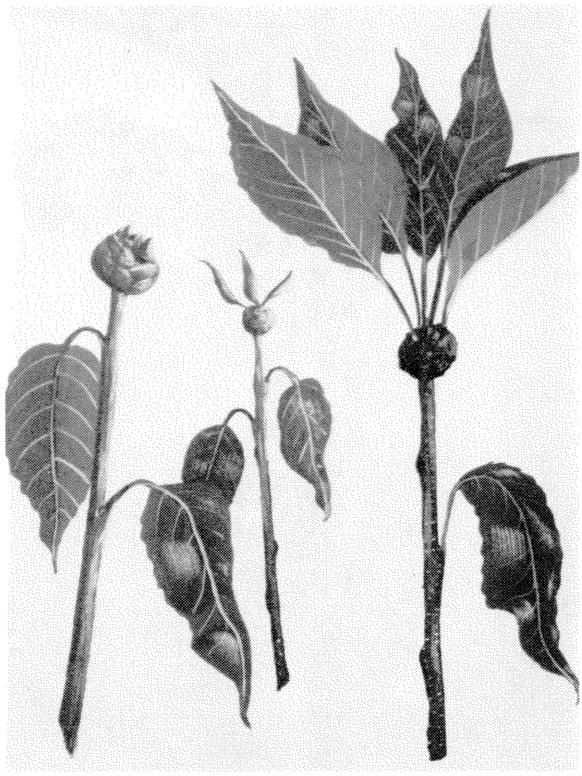

Figure 6.—Multiple branches developing on gall caused by *C. serotinae.*

Figure 7.—Multiple branches developing on gall 1 year later.

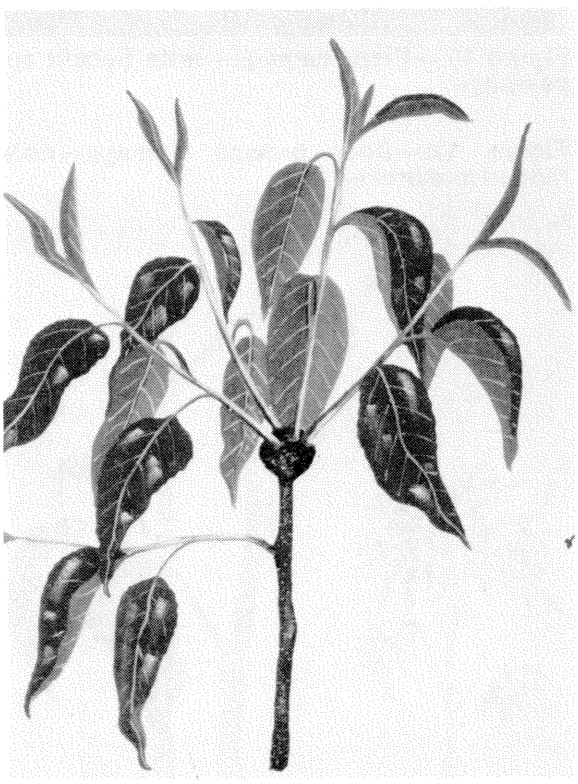

Figure 8.—Multiple branches several years after attack by *C. serotinae.*

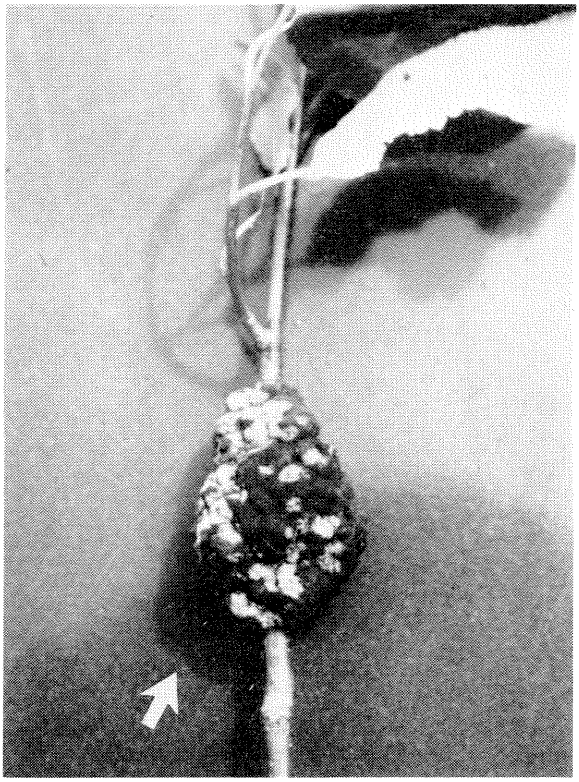

Figure 9.—Black knot tumor.

Figure 10.—Frost damage—note flaccid appearance.

Figure 11.—Terminal injury by deer.

Figure 12.—Deer browse damage—note ragged and broken tips.

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