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Pecan Husbandry: Challenges and Opportunities

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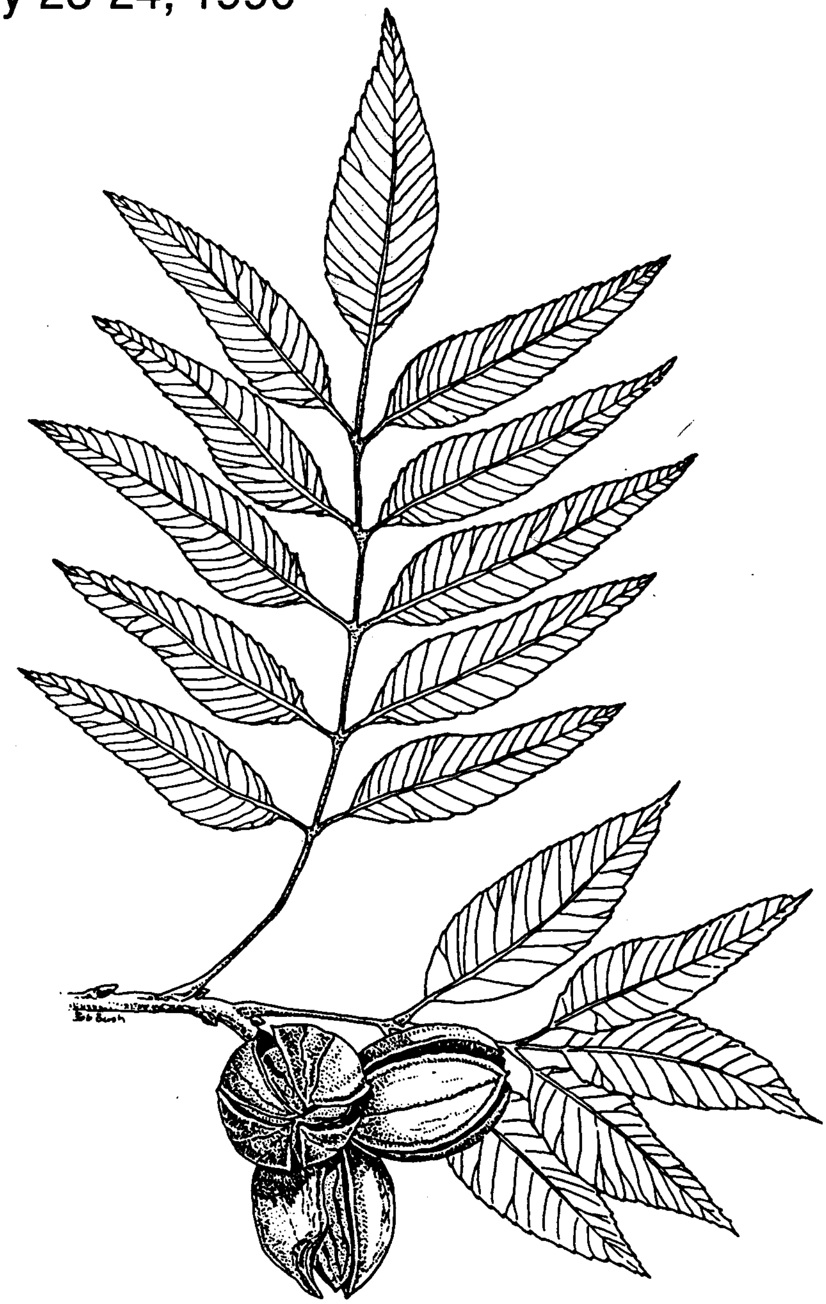

INSECTS AND PECAN PRODUCTION

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The complex of insect pests on pecan causes considerable damage to the tree and its foliage and nuts each season. Foliar insect damage accelerates leaf drop in the fall leading to reduced reblooming of both pistillate and staminate flowers the following spring. Nut feeding insects cause direct yield losses each season. In addition, before harvest the tree naturally loses 23-45% of the pistillate flowers and fruit from natural abortion (Sparks and Madden 1984). Short term (less than four years) effects of aphid control have been reported (Dutcher et al. 1984, Dutcher 1985, Wood and Tedders 1986). We report the results of research on the long term impact of pecan aphid control with aldicarb compared to control of aphids with foliar insecticide applications. The impact of pecan weevil damage on pecan production was gleaned from the literature (Boethel et al. 1976a, 1976b, Criswell et al. 1975, Dutcher and Payne 1981, Hall et al. 1979, Hall and Eikenbary 1983, Harris 1976, Raney et al. 1970, Tedders and Osburn 1971).

Method and Materials

The impact of aphid control was determined over a nine year period at an experimental, drip-irrigated, pecan orchard in Sumter Co., Georgia. The site was a mature orchard with sixty-year-old trees planted on a 18 x 18 m spacing. The orchard floor was a mowed sod with a herbicided strip running down the tree row, 2 m on either side of each tree. The trees were divided into three groups based on the type of aphid control applied during the season: 1) untreated trees; 2) trees treated with foliar applications of esfenvalerate (@ 0.11 kg ai/ha), endosulfan (@ 0.82 kg ai/ha), cypermethrin (@ 0.11 kg ai/ha) or bifenthrin (@ 0.082 kg ai/ha) for pecan aphid control; and 3) trees treated with aldicarb as an emitter adjacent application at 2.6 kg ai/ha and applied on July 15 each year (Dutcher and Harrison 1984). Treatments 2 and 3 were sprayed with carbaryl each season for pecan weevil control by the guidelines of the University of Georgia Cooperative Extension Service (Ellis and Bertrand 1979). Treatments were not applied to the same plots for the entire duration of the study as control trees would have gone into a nonbearing mode for several years. Rather, plots were rotated between treatments at the beginning of each season so that plots were not in the control group or the aldicarb treated group for consecutive seasons. The untreated trees often suffered high infestations of nut pests and these losses were difficult to separate from losses caused by a lack of aphid control. Therefore, the infestation information collected in the untreated trees was used to show the presence and relative size of the pest infestations and overall production between aldicarb and foliar insecticide treated trees were compared. Yield was measured at harvest in the late fall during each season from 1981-1989.

Results

Trees treated with aldicarb had higher production than trees treated with foliar insecticides alone in all years except for 1987 when the Stuart trees with foliar applied aphid controls outproduced the trees with aldicarb treatments. Overall production increases by aldicarb applications were 32% for Schley (Fig. 1) and 22% for Stuart (Fig. 2).

Pecan weevil damage and the density of the emerging adult population have been measured in Oklahoma (Eikenbary et al. 1977) where two carbaryl treated populations of 25 and 15 weevils/trap-year, respectively, had 2.4% and 0.6% damage with average yields of 205 and 170 lbs of pecans per tree. In the same study, weevil populations of 88, 197 and 400 weevils/tree (estimated by knockdown sprays), respectively, caused 57, 60 and 90% damage to average crops of 45, 40 and 40 lbs/tree. In Georgia, Payne et al. (1985) found that closed cone cage trap catches of 8, 7, 7, and 3.5 weevils/trap-year corresponded to damage ratings of 23, 61, 30, and 12% damage, respectively, for the 1978, 1979, 1980, and 1981 seasons, where, 1979 had a relatively low yield.

Dutcher and Payne (1981) found that an average cone cage trap catch of 23 weevils/trap-year corresponded to 40% damage with an average yield of 120 lbs/tree. Dutcher and Payne (1988) in an insecticide evaluation where the treatments did not control the pecan weevil, found that, in the treatments and the untreated control, an average

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weevil emergence density of 1.25 weevils/trap-year corresponded to 58% damage with a yield of 28 lbs/tree. These results indicate that pecan weevil damage is only marginally related to trap catch within an orchard. The percent damage tended to be higher in the plots with a low yield than in plots with a high yield. Pecan weevil damage is highly variable between trees within the same orchard and year. Trap catch beneath a tree is not usually related to the damage cause in the same tree (Dutcher and Payne 1981). The range of percent weevil damage in untreated trees in orchards with a pecan weevil infestation ranges from 0.5 to 90%.

Discussion

Pecan production losses caused by poor aphid control are not readily apparent during the first year of a poor control program. The reductions occur after two and three seasons of poor control. The mechanism for these yield reductions is a decrease in reblooming of pistillate flowers in the spring following a fall with reduced foliage retention caused by aphid damage. The reblooming reduction response occurs: As a step function to severe and not moderate or low aphid damage after the first year; as a linear response after the second year; and as a step function to severe and moderate and not low aphid damage after the third year (Dutcher et al. 1984, Dutcher and Harrison 1984, Dutcher 1985). Fortunately, the trees will respond with increased reblooming after one season of excellent aphid control, without regard to their previous amount of aphid damage (Dutcher 1985, unpublished annual research report).

The damage potential of the pecan weevil is high and preventative pecan weevil control requires preventative treatment with carbaryl. Oviposition success is related to nut phenology (Calcote 1975, Criswell et al. 1975, Harris 1976a, 1976b, Dutcher and Payne 1981). Emergence of adults is associated edaphic control variables (Harris and Ring 1980, Dutcher and Payne 1981, Alverson et al. 1984). In Oklahoma, losses from premature nut drop caused by pecan weevil feeding before the kernels are susceptible to oviposition can account for 23-47% of the pecan weevil damage in orchards were the trees were sprayed to prevent successful oviposition (Hall et al. 1981). The variables controlling pecan weevil damage have not been measured in enough field experiments to produce a model of this important bionomic event with any regional applicability. Yield of the pecan under the best available conditions is irregular and variability between trees in any year (Worley et al. 1983) making it very difficult to determine yield differences in field experiments.

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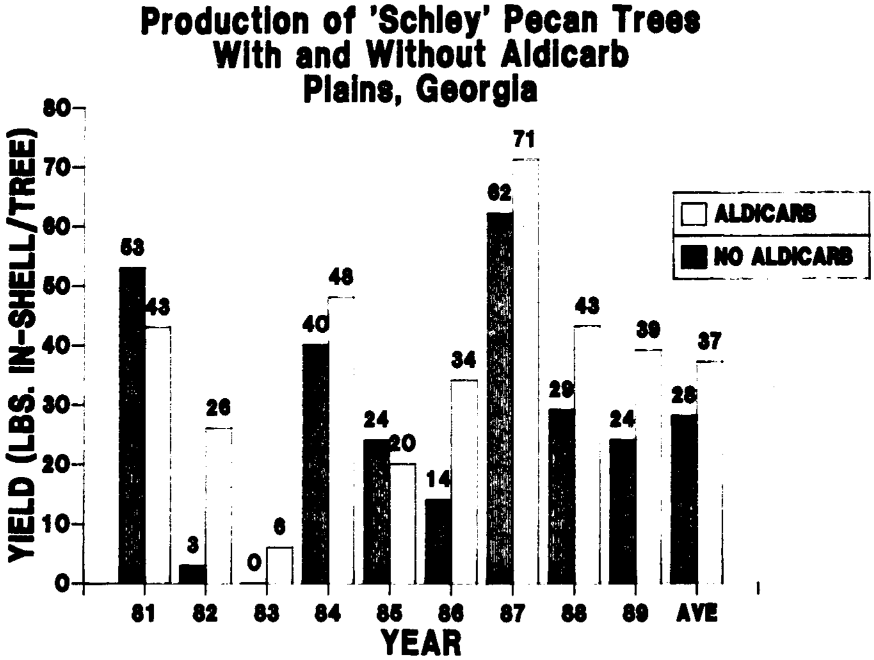

Figure 1. Production of 'Schley' pecan trees with and without aldicarb, Plains, Georgia.

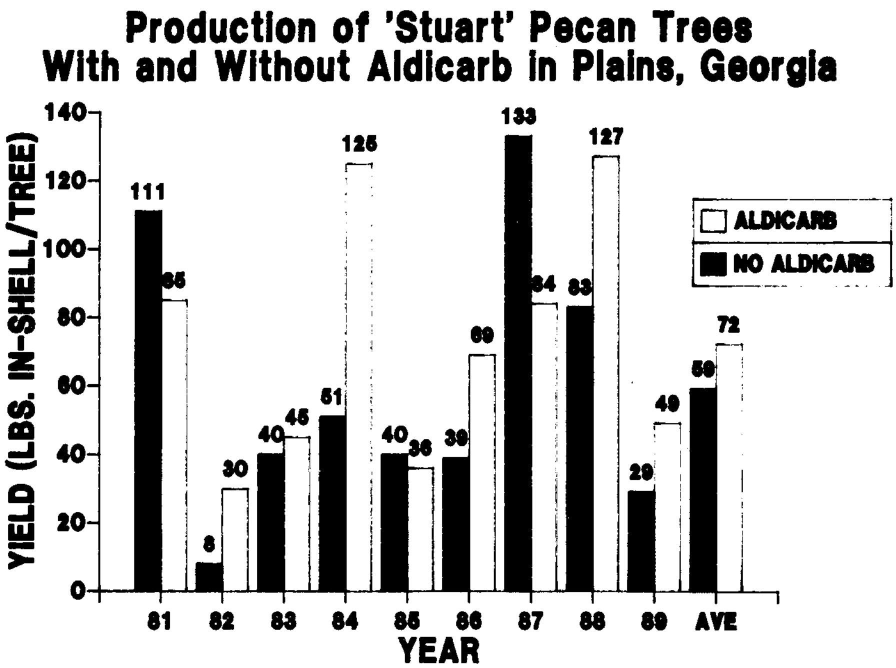

Figure 2. Production of 'Stuart' pecan trees with and without aldicarb, Plains, Georgia.