WITHIN-TREE DISTRIBUTION OF CATFACING INJURY ON PEACHES IN NORTH CAROLINA[1]

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Abstract: Two experiments were conducted to determine the within-tree distribution of catfacing injury on peaches. In the first experiment, three two-way comparisons were made among upper and lower levels, inside and outside areas, and between-row and within-row areas. The second experiment examined more closely the vertical distribution of catfacing injury by sampling damaged fruit within three vertical strata. Statistical analyses from both experiments suggested that damage inflicted by catfacing insects is randomly distributed over the tree, and current methods of "random" selection of fruit are unbiased.

Key Words: Hemiptera, sampling, spatial patterns, catfacing, peaches.

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The efficacy of various insecticides and other management tactics against insect pests of peaches is usually determined by examining a sample of fruit for evidence of damage. A sample may consist of from 25 to 200 randomly-selected fruit per treatment plot (Bobb 1970; Phillips and DeRonde 1966), but researchers have failed to reveal exact methods for random selection of fruit or whether damaged fruit is randomly distributed over the tree.

Catfacing damage to peach tree fruit in North Carolina is caused by an hemipteran complex which includes the tarnished plant bug, *Lygus lineolaris* Palisot de Beauvois, and several stink bugs [*Acrosternum hilare* (Say), *Euschistus servus* (Say), *E. tristigmus* (Say), *E. variolarius* (Palisot de Beauvois), and *Thyanta custator* (F.) (Meyer and Ritchie 1983)]. This paper describes experiments which were designed to determine the within-tree distribution of catfacing injury.

MATERIALS AND METHODS

The orchard used in the first experiment was a 4-ha commercial block of 18-yr-old trees of various cultivars located in Nash Co., NC. This orchard received regular applications of insecticides (azinphosmethyl and carbaryl) and fungicides (captan, sulfur, and benomyl). Orchard-floor vegetation consisted primarily of large crab grass, *Digitaria sanguinalis* (L.) Scopoli. Within-tree distribution of catfacing injury was determined by sampling ten 'Biscoe' peach trees which were selected on the basis of fruit load and evenness of foliage. Sample trees were located within three rows of the border of the orchard. All ripe fruit on the trees were sampled, thus sampling occurred during different intervals in early- and mid-August. Each tree was divided using a modified post and string system (Meagher and Hull 1987) so that three two-way comparisons could be made. Fruit located in upper levels

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(above 1.5 m) were compared with those in lower levels, inside area fruit (trunk of tree to 1.5 m) were compared to outside area fruit, and between-row (BROW) area fruit were compared to within-row (WROW) area fruit. The BROW areas faced the alley between rows; the WROW areas faced adjacent trees in the row. Analysis of variance and a mean separation test (Duncan's Multiple Range Test) (SAS Institute 1982) were used to test the hypothesis that there were no significant differences among strata in percentage of catfaced fruit. Also, contrasts were made between upper and lower, inner and outer, and BROW and WROW areas. A Spearman rank correlation analysis was used to test the hypothesis that the percentage of catfaced fruit and total fruit were related (SAS Institute 1982).

The orchard used in the second experiment was a 29-yr-old planting of 'Elberta' peaches at the Central Crops Research Station in Clayton, Johnston Co., NC. Dominant vegetation on the orchard floor included pansy (*Viola rafinesquii* Greene), chickweed [*Stellaria media* (L.) Cyrillo], vetch (*Vicia* sp.), sheep-sorrel (*Rumex acetosella* L.), common dandelion (*Taraxacum officinale* Wiggers), and bermuda grass (*Cynodon dactylon* L.). Ground cover management consisted entirely of mowing, but for experimental purposes, the orchard was not mowed until late in the season (mid-July). Ten trees were randomly chosen from a 0.16-ha block that had been treated with full-schedule (10) applications of fungicides (sulfur and captan), but no insecticides. During mid-August, a wooden pole calibrated in meters was propped against each tree (perpendicular to the ground), and all fruit were harvested and labeled as belonging to one of three possible height ranges: 0 - 1, 1 - 2, or > 2 m. All fruit were examined for evidence of damage from catfacing insects, and the data were analyzed by a 2 × 3 chi-square contingency table.

RESULTS AND DISCUSSION

Analysis of variance from the first experiment was not significant ($P = 0.1938$), and the mean separation test showed little difference among strata (Table 1). Paired contrasts showed no significant differences, although slightly more fruit injury was found in the upper areas (Table 2). The rank correlation analysis was not significant ($P = 0.3222$), suggesting that there was no relationship between catfacing injury and the number of fruit per stratum. Biovin and Stewart (1983) found no significant difference in population densities between the upper and lower strata or among directional quadrants of apple trees when sampling for adults and nymphs of four mirid species.

The second experiment examined more closely the vertical distribution of catfacing injury. Catfacing data were pooled from all trees according to height range (Table 3). The percentage of fruit damaged by catfacing insects, while extensive at all levels, increased slightly in progressively greater height ranges. The chi-square test for significance of damage showed no significant differences in amounts of damage among the three height ranges ($\chi^2 = 3.19$, df = 2, $P > 0.05$). A small number of fruit were located above 3 m, but since commercially grown trees seldom exceed this height, these fruit were included in the third height range.

The results from both studies suggest that fruit damage by catfacing insects is randomly distributed over the tree, and current methods for "random" selection of fruit give unbiased estimates of damage.

Table 1. Mean percentage of 'Biscoe' peaches with catfacing injury per stratum, n = 10, Nash Co., NC, 1986.

Stratum*	% mean ± SE	Duncan grouping
9	29.1 ± 4.4	a
1	27.0 ± 6.7	a
14	24.5 ± 5.2	ab
11	23.3 ± 3.9	ab
12	22.2 ± 2.3	ab
6	20.8 ± 9.2	ab
15	20.8 ± 3.0	ab
10	20.2 ± 6.9	ab
3	18.1 ± 4.9	ab
8	16.5 ± 4.3	ab
16	14.8 ± 2.8	ab
5	14.8 ± 2.1	ab
4	14.6 ± 3.1	ab
7	13.9 ± 3.2	ab
13	13.6 ± 1.8	ab
2	10.6 ± 2.9	b

* Lower strata = 1 - 8; upper strata = 9 - 16; inside strata = odd; outside strata = even; WROW strata = 1, 2, 5, 6, 9, 10, 13, 14; BROW strata = 3, 4, 7, 8, 11, 12, 15, 16.

Table 2. Mean percentage of 'Biscoe' peaches with catfacing injury per area in tree, n = 10, Nash Co., North Carolina, 1986.

Area	Mean ± SE	Pr > F
Upper	19.2 ± 1.56	0.0805
Lower	15.1 ± 1.38	
Inside	20.0 ± 2.15	0.3708
Outside	15.9 ± 1.23	
WROW	18.2 ± 1.83	0.3753
BROW	16.6 ± 1.58	

Table 3. Mean percentage of 'Elberta' peaches with catfacing injury per height in 10 trees, Johnston Co., NC, 1983.

Height range (m)	Total no. of fruit	% catfacing*
0 - 1	584	6.0
1 - 2	1828	6.6
> 2	1813	7.8

* χ^2 = 3.19, df = 2, not significant at P = 0.05.

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