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# IR-4 Ornamental Horticulture Program
# Research Report Cover Sheet


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**Trial:** 2007 KY

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**ProjectTitle:** Scale Efficacy

**Protocol #:** 07-024

| PR# | Research Target | Crop/Plant | Product | EPA Reg. # | Production Site | Status |
|---|---|---|---|---|---|---|
| 26720 | Calico Scale<br>*Eulecanium cerasorum* | Japanese Zelkova<br>*Zelkova serrata* | Safari 20SG<br>*Dinotefuran* | 33657-16-5963<br>*Valent* | Commercial Lands | C |

# Systemic Control of Calico Scale with Bark- or Soil-applied Dinotefuron (Safari®)

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**Nature of Work:**

Calico scale, an invasive soft scale pest of shade and ornamental trees, has reached outbreak levels in Kentucky and elsewhere in the eastern United States (1, 2). Heavily infested trees suffer branch tieback and may be severely stressed or killed. In spring, maturing females produce copious honeydew that attracts wasps and other nuisance insects and promotes growth of unsightly sooty mold. Honeydew falling on parked vehicles, decks, or other objects may require removal of infested trees. Hosts include sugar and Norway maple, sweetgum, honey locust, Japanese zelkova, dogwood, crabapples, and other cultivated trees, as well as wild hackberry.

Calico scale is univoltine, overwintering as second instars on twigs, branches, and trunks and molting to the adult stage in late March to mid-April in Kentucky (1). Females each produce several thousand eggs that hatch in mid- to late May. Crawlers disperse for 2–3 weeks and nearly all of them settle on leaves by mid-June. Settled crawlers molt to second instars in mid-summer which continue feeding on leaves until just before leaf abscission in autumn when they move to overwintering sites on bark. In Kentucky, calico scale is a particular problem on horse farms where rows of single tree species are planted in narrow grassy strips bordering pastures or paddocks. Labeled grazing restrictions, concern about equine exposure to spray drift, and liability often preclude spraying on such sites. Similar concerns exist in urban landscapes. Systemic application via trunk or soil injection, soil drench, or basal trunk application can alleviate the hazard of spraying landscape trees. This trial was conducted to evaluate efficacy of Safari (dinotefuron), a nicotinoid with a favorable toxicological profile, via two methods of systemic application: soil injection or basal trunk trunk spray with in combination with Pentra-Bark (Agrichem, Medina, OH), a bark-penetrating surfactant.

The study site was two rows of mature zelkova trees (mean (± SE) trunk diameter: 10 ± 0.4 inches (25.4 ± 1 cm) at 1 m above ground) planted in full sun on either side of a lightly-traveled road near the University of Kentucky Motor Pool, Lexington, KY. Safari 20G was evaluated at 8.5 g product per inch diameter via high volume soil injection at 100 PSI pressure. The solution was injected 4–6" (10–15") deep in a grid from 1–3 ft (30–91 cm) from the trunk, with 12–15 injection points per tree. There were two treatment dates: 18 April and 15 May 2007, with four trees treated on each date. Soil injections were made by Larry Hanks (ISA-certified consulting arborist).

A solution of Safari 20G and Pentra-Bark (13 oz Safari with 3.1 oz Pentra-Bark in 1.1 gallons of water) was applied to runoff to bark of the trunk and bases of the main scaffold limbs (6' height to ground level) of another four trees on 18 April 2007. Calico scale females were not directly sprayed as they were higher up in the trees than where the sprays were applied.

Efficacy was evaluated 30 July to 2 August by sampling eight twigs (one from each cardinal direction in the lower and middle thirds (< 3 m and about 5 m height, respectively) of each tree canopy; 8 twigs per tree), removing the two most basal (oldest) leaves from each twig, and counting all living scale nymphs on the left half of the abaxial surface of each leaf (about 3000 total scales). Leaves and scales were examined under a binocular microscope. Living

nymphs were yellowish and succulent, whereas dead scales appear orange-brown, dried out, and when touched with a probe will easily flake off the leaf surface. Data were analyzed by one-way ANOVA with means separated by Dunnett's test for treatments versus control.

**Results and Discussion:**

Results are summarized in Table 1. One of the control trees, a relatively small tree at the end of the row, was atypical in having very low numbers of scales (76, versus 587, 410, and 254 scales per sample for the other replicates). Data therefore were analyzed both with and without that tree (in he latter case, the outlier tree was entered into the data set as a "missing value". Safari, particularly the application with Pentra-Bark, provided significant control of calico scale nymphs on the leaves, which should translate to fewer honeydew-producing adults next spring. We observed no obvious immediate kill of egg-laden females following either the April or May applications, so the aforementioned reductions are attributed to activity against the settled crawlers on the leaves.

**Significance to the Industry:**

This research indicates that dinotefuron (Safari), especially when applied as a basal trunk application with Pentra-Bark, can provide good control of calico scale on mature zelkova trees. Efficacy of this approach warrants further evaluation against calico scale on additional sites and tree species, and against other species of soft and armored scale insects. This level of control is higher than previously obtained with trunk injections with imidacloprid or bidrin, or with soil injection of imidacloprid (2). If dinotefuron with Pentra-Bark works consistently as well as it did in this trial, it could provide a valuable tool for managing scale insect infestations on horse farms, street trees, landscape settings, and other sensitive sites where canopy sprays are impractical.

References

1. Hubbard, J.L. and D.A. Potter. 2005. Life history and natural enemy associations of calico scale, *Eulecanium cerasorum* (Homoptera: Coccidae), in Kentucky. J. Econ. Entomol. 98: 1202-1212.

2. Hubbard, J.L. and D.A. Potter. 2006. Managing calico scale (Hemiptera: Coccidae) infestations on landscape trees. Arboriculture and Urban Forestry 32: 138–147.

Table 1. Efficacy of Safari 20 SG for systemic control of calico scale on mature *Zelkova serrata* trees in the landscape, 2007.

| | | All trees included | | Atypical untreated tree with low infestation excluded | |
|---|---|---|---|---|---|
| Treatment | Treatment date | Live scales per sample | % control | Live scales per sample | % control |
| Untreated | – | 332 ± 109 | | 417 ± 96 | |
| Soil injection | 18 April | 159 ± 33 | 52.1 | 159 ± 33* | 61.9 |
| Soil injection | 15 May | 119 ± 34* | 64.2 | 119 ± 34* | 71.5 |
| Bark spray with Pentra-Bark | 18 April | 65 ± 29* | 80.4 | 65 ± 29* | 84.4 |

ANOVA results: for all trees; $F = 3.56$; df = 3, 12; $P < 0.05$; with atypical control tree excluded; $F = 9.41$; df = 3, 11; $P < 0.005$. Asterisk denotes mean is significantly lower than mean for untreated trees (Dunnett's test, $P < 0.05$).