blessures de coupes conventionnelles étaient de 30 à 50 pourcent plus larges que les blessures de coupes Shigo. Il y avait peu de cicatrisation des blessures Shigo durant la première année. Après quatre ans, les blessures conventionnelles étaient plus petites que les blessures Shigo sur six espèces, de dimensions approximativement semblables sur une espèce et plus larges sur trois espèces.

Zusammenfassung: Äste von 10 verschiendenen Baumsorten wurden mit dem "Shigo" und den üblichen Methoden ausgelaubt. Die Äste (vier per Baum, fünf Bäume per Sorte) waren durchschnittlich 50 bis 75 mm im Durchmesser. Die Wunden von den üblichen Schnitten waren 30 bis 50 Prozent grosser als die Wunden von den Shigo Schnitten. Es gab wenig Zusammenwachsen von den Shigo Wunden wahrend des ersten Jahres. Nach vier Jahren waren die üblichen Wunden bei sechs Sorten kleiner als bei den Shigo Wunden, ungefähr die gleiche Grosse bei einer Sorte und grosser bei drei Sorten.

Center for Biodiversity
Illinois Natural History Survey
607 East Peabody Drive
Champaign, IL 61820

PHYTOTOXICITY OF SUNSPRAY ULTRA-FINE SPRAY OIL® AND SAFER INSECTICIDAL CONCENTRATE® SOAP ON SELECTED ORNAMENTAL PLANTS IN SUMMER IN NORTH FLORIDA AND SOUTH GEORGIA

by Russell F. Mizell, III[1]

Abstract. Two percent Sunspray Ultra-fine Spray® oil and Safer Insecticidal Concentrate® soap were applied 5 times in separate treatments to 30 species of trees and shrubs growing in containers under commercial nursery conditions in north Florida. A similar test was conducted on 17 species of container-grown ornamentals in south Georgia. Horticultural oil and soap were applied at 10 day intervals beginning July 16, 1990. Plants were visually rated for phytotoxicity prior to the second through fifth application and 10 days after the fifth application. A third test of only three applications of horticultural oil or soap on 9 species of plants was conducted at Monticello, Florida beginning August 28, 1990. All the treatments were applied from 9:30 - 11:00 A.M. and daily temperatures were above 35° each day. No phytotoxicity was observed on any of the plants tested.

Environmental and sociological concerns that accompany the application of conventional pesticides for pest control have shifted research attention to the evaluation of alternative methods. Traditionally, horticultural oils have been recommended for use in the dormant season for insect and mite control on a variety of plant species. Phytotoxicity caused by the older, less refined brands of horticultural oils precluded their use during the active growing season. However, many new, more refined horticultural oils and soaps reduce the risk of phytotoxicity. Thus they have much promise as effective alternatives to conventional pesticides, fitting well into integrated pest management programs that seek to reduce pesticide use (1, 2, 3).

Previous work in Maryland (2) and New York (1) discussed the results of both phytotoxicity and efficacy studies using Sunspray 6E horticultural oil under summer conditions. Discoloration was observed on 6 of 52 species tested (two species of maple, a juniper, a blue spruce, a red oak and an arborvitae) and the authors urged caution if 2% Sunspray oil was used repetitively on these plants (2). Excellent control of spider mites, scales, whiteflies, aphids, and mealybugs using 2-3% Sunspray 6E oil was documented in New York (1). Some phytotoxicity from 3% oil to several walnut (*Juglans* sp.) cultivars and some apparently permanent foliage discoloration to several juniper cultivars were reported (1).

Repellency and toxicity of horticultural oil to

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greenhouse whitefly, *Trialeurodes vaporariorum* (Westwood) have been reported (3). Also a reduction in the spread of an aphid-vectored virus was observed as a result of mortality to the aphid vectors from insecticidal soap (3).

The present study was initiated to test the potential for phytotoxicity to ornamental plants under the environmental conditions of commercial nurseries in south Georgia and north Florida.

Materials and Methods

Plants for the test were selected at random for uniformity of size and appearance from a large bed of similar plants. Plants in experiment 1 were located at a commercial nursery in Monticello, Florida. Three plants (replicates) from each cultivar in 2-3 gal. containers were grouped together for each of the 3 treatments: untreated control, 2% Sunspray Ultra-fine Spray oil, and 2% Safer Insecticidal Concentrate soap. Plants in experiment 2 were located at a commercial nursery in Cairo, Georgia. Plants normally grown under shade conditions (i.e. aucuba, camellia and azalea) were held under shade during the test. The Georgia plants were in 1 gal. containers. Plants in experiment 3 were tested at the author's laboratory in Monticello, Florida. Plants in this test were in 1-2 gal. containers. All plants were held under commercial nursery conditions of overhead irrigation and fertilizer, etc. No cultural factors were added or changed during the course of the tests.

The oil and soap treatments were applied to plants with a Solo[R] backpack sprayer to runoff in a 2% solution at a volume of 100 gal. per acre. All applications were made between 9:30 and 11:00 A.M. on clear, sunny days. Daytime temperatures were typical of the season in south Georgia and north Florida reaching above 35°C and above 65% relative humidity in the afternoon on all spray dates. Plants in experiments 1 and 2 were sprayed on 16 July, 27 July, 7 August, 17 August and 28 August. Plants in experiment 3 were sprayed on 28 August, 7 September and 17 September. Evaluations were made on the spray dates before the application of the treatments and 10 days after the last application date. Treated plants were observed and compared to untreated control plants for any changes in appearance of the foliage. No pests were observed on the plants

Table 1. List of plants sprayed with Sunspray Ultra-fine Spray[R] oil and Safer Insecticidal Concentrate[R] soap in three separate experiments in south Georgia and north Florida during July-September, 1990.

Experiment 1: Monticello, Florida

1. *Malus domestica* 'Anna', apple
2. *Prunus persica* 'Flordaking', peach
3. *Pyrus communis* 'Flordahome', pear
4. *Prunus salicina* 'Methley', plum
5. *Prunus avium* 'Bing', (sweet) cherry
6. *Ficus carica* 'Brown Turkey', fig
7. *Vitis* hybrid 'Suwannee', bunch grape
8. *Carya illinoensis* 'Stuart', pecan
9. *Betula nigra,* river birch
10. *Prunus laurocerasus,* cherry laurel
11. *Pinus taeda, loblolly pine*
12. *Populus nigra,* Lombardy poplar
13. *Koelreuteria paniculata,* Golden rain tree
14. *Platanus occidentalis,* American sycamore
15. *Liriodendron tulipifera,* tulip tree
16. *Salix babylonia,* Gold weeping willow
17. Malus sylvestris, floribunda crab apple
18. *Taxodium distichum,* bald cypress
19. *Ginkgo biloba,* ginko
20. *Ilex* x *attenuata,* fosteri holly
21. *Acer rubrum,* red maple
22. *Quercus laurifolia,* laurel oak
23. *Quercus shumardi,* shumard oak
24. *Cercis canadensis,* redbud
25. *Magnolia* x *soulangia,* saucer magnolia
26. *Hibiscus syriacus,* purple althea
27. *Spirea vanhoutteii,* Van houttei spirea
28. *Photinia* x *fraseri,* photinia
29. *Hemerocallis* sp., daylily
30. *Lagerstroemia indica* 'Tuscarora', crape myrtle

Experiment 2: Cairo, Georgia

1. *Rosa* sp. 'Bonica', Meidiland rose
2. *Weigela florida,* Florida weigelia
3. *Buxus microphylla,* boxwood
4. *Raphiolepis indica* 'Clara', Indian hawthorne
5. *Juniperus squamata* 'Parsoni', juniper
6. *Buddleia davidii,* buddleia
7. *Ilex crenata* 'Hetzii', holly
8. *Spirea japonica* 'Shiro Bana' spirea
9. Ilex x *meserveae* 'Blue Prince', holly
10. *Hemerocallis* sp. 'Red Supreme' daylily
11. *Forsythia* x *viridissima* 'Bronyensis' forsythia
12. *Aucuba japonica,* aucuba
13. *Euonymous marginata, euonymous*
14. *Rhododendron* sp. 'Silver Sword', azalea
15. *Camellia japonica,* camellia
16. *Juniperus stricta* 'Excelsior Stricta', juniper
17. *Juniperus chinensis* 'Torulosa', juniper

Experiment 3: Monticello, Florida

1. *Buxus microphylla,* boxwood
2. *Rhododendron* sp. 'Mother's Day', azalea
3. *Juniperus chinensis* 'San Jose', juniper
4. *Juniperus horizontalis* 'Prince-of-Wales', juniper
5. *Juniperus chinensis* 'Procumbens Nana', juniper
6. *Ilex vomitoria* 'Schelling's Dwarf', vomitoria holly
7. *Pyracantha koidzumii* 'Mohave', pyracantha
8. *Ligustrum* x *vicaryi* 'Vicaryi', ligustrum
9. *Euonymous japonica* 'Aureo marginata', euonymous

and efficacy against pests was not evaluated.

Results and Discussion

Table 1 lists the cultivars tested in the 3 experiments. No phytotoxicity was observed on any of the plants from the repetitive oil or soap treatments. Aucuba sprayed with oil did yellow slightly after the third application. However, the change in appearance was not enough to affect the salable quality. In experiment 2, the three 1 gal. boxwood plants treated with oil died during the test. Foliage symptoms indicated that apparently this resulted from a root disease and not the oil. Boxwoods in 2 gal. containers were tested again in experiment 3 and phytotoxicity was not observed. No change was observed in the color of the juniper cultivars tested. However, changes in juniper color often do not show up until cool weather in the deep South and this problem needs further consideration. Previous work reported discoloration of some juniper cultivars (2).

It can be concluded from this test and the literature (1, 2) that the more refined horticultural oils can be safely used in the summer season in the eastern U.S. without general problems of phytotoxicity. Because of the large numbers of species and cultivars of plants grown in southern nurseries it will be impossible to rigorously test them all. No doubt some plants are sensitive to the oils and perhaps soaps and growers should spray a few plants of suspected sensitive species before applications to large numbers of plants. Phytotoxicity may be enhanced on plants that are under conditions of stress; although tests with horticultural oil on drought stressed plants indicated phytotoxicity to only a few cultivars (1, 2). The application of adequate irrigation to plants before treatment with horticultural oil is highly recommended. The risk of phytotoxicity from horticultural oil may be higher to plants that have not yet hardened off during days in the fall when drastic changes in daily temperature often occur in the deep South.

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Associate Professor of Entomology
Agricultural Research and Education Center
University of Florida
Rt. 4, Box 4092
Monticello, Florida 32344

Résumé. Deux pourcent d'huile Sunspray Ultra-fine Spray® et de savon Safer Insecticidal Concentrate® étaient appliqués dans des traitements séparés, à cinq reprises, sur 30 espèces d'arbres et arbustes en croissance dans des contenants en conditions de pépinière commerciale dans le nord la Floride. Un test semblable était mené sur 17 espèces d'ornement dans des conteneurs de croissance dans le sud la Georgie. L'huile horticole et le savon étaient appliqués à dix jours d'intervale *débutant le 16 juillet 1990. Les plantes étaient visuellement* évaluées en regard de la phytotoxicité antérieurement à la seconde jusqu'à la cinquième application et dix jours après la cinquième application. Un troisième test de seulement trois application d'huile horticole ou de savon était memé à Monticello, Floride, sur neuf espèces de plantes débutant le 28 août 1990. Tous les traitements étaient appliqués entre 9:30 et 11:00 du matin et les températures journalières étaient au-dessus de 35° C chaque jour. Aucune phytotoxicité était observée sur les plantes testées.

Zusammenfassung: Zwei Prozent Sunspray Ultra-fine Spray öl und Safer Insecticidal Concentrate Seife wurde fünfmal in getrennten Behandlungen von 30 Arten von Bäumen und Büschen, die in Behälter unter kommerziellen Forstgartenverhältnissen in Nord-Florida aufgewachsen sind, angewendet. Eine ähnliche Untersuchung wurde bei 17 Arten von Schmuckpflanzen, die in Behälter in Süd-Georgia aufgewachsen sind, durchgeführt. Gartenbauöl und -seife wurden alle 10 Tage seit dem 16. Juli 1990 angewendet. Die Pflanzen wurden vor der zweiten bis zur fünften Anwendung und zehn Tage nach der fünften Anwendung für Phytotoxizität per Auge geschätzt. Eine dritte Untersuchung von nur drei Anwendungen Gartenbauöl oder Seife wurde bei 9 Pflanzenarten in Monticello, Florida beginnend am 28. August 1990 durchgeführt. Alle Behandlungen wurden zwischen 9 Uhr 30 und 11 Uhr angewendet und die Temperatur war jeden Tag über 35 Grad Celsius. Keine Phytotoxizität wurde unter allen Pflanzen beobachtet.