PROGRESS REPORT FOR
CHEMCIAL WEED CONTROL FOR EXPORT GRADE POTTED ORCHIDS AND ANTHURIUMS.
Period 01/01/00 – 12/31/00
P.I. - Dr. Joe DeFrank Dept. of TPSS, UH-Manoa.

Objective 1. Continue the currently installed herbicide studies with preemergence herbicides in orchids and anthuriums.

Preemeregence herbicides applied to 4 potted anthurium cultivars:

An experiment to determine the response of 4 potted anthurium cultivars to sequential preemergence herbicide applications was conducted at Green Point Nursery (owner Harold Tanouye) located in Mt. View on the Big Island. The four cultivars selected for treatment were: "Lady Ann", "Sundial", "Tropic Fire", and "Nicoya". The herbicides were applied at two rates, the anticipated labeled use rate (1X) and two times the anticipated labeled use rate (2X). The herbicides evaluated in this experiment were Direx 4L (diuron), Gallery (isoxaben), Spartan (sulfentrazone) and Surflan (oryzalin). Herbicide applications were directed to the base of plants to avoid direct contact with leaves and flowers. The first application was applied on 11/11/99 with sequential applications made at 64, 69, 70 and 98 day intervals for a total of 5 sprays. Visual injury ratings were made through out the course of the experiment. On 11/16/00 (71 days after the last spray application) the experiment was terminated. Each plant was collected for measurements of growth and dry weight accumulation.

Analysis of visual injury ratings indicated that Spartan at both rates consistently caused stunted growth and distorted leaf growth across all cultivars tested. All other treatments caused no significant reduction in plant vigor or injury to leaf tissue. The plant data collected at the end of the experiment included total leaf number, total flower number and dry weights for leaves and flowers combined, shoots (stems and leaf petioles), and roots.

All cultivars responded to herbicide applications in a similar way with regards to leaf and flower number at the end of the experiment, Gallery was the only herbicide to significantly reduce leaf number and Spartan was the only herbicide to reduce flower number. Spartan was the only herbicide to reduce the dry weight of leaves and shoots below that of untreated plants. Root dry weight was significantly reduced by all herbicide treatments except Direx 4L.

Several conclusions can be made based on the response of 4 anthurium cultivars to sequential applications of the herbicides used in this experiment. Direx 4L at both 1X and 2X application rates had the least detrimental impact on anthurium growth and appearance in comparison to untreated plants. Spartan consistently caused stunting, misshapen leaves and reduced crop growth. Although Gallery and Surflan did not cause any visible injury symptoms, both significantly reduce root dry weight accumulation. The data from this experiment supports a request for labeling of Direx 4L and possibly Surflan for directed applications on all four anthurium cultivars tested.

Preemeregence herbicides applied to 3 potted orchid cultivars:

An experiment to determine the response of 3 potted orchid cultivars to sequential preemergence herbicide applications is currently under way at Newman's Nursery in Pahoa on the Big Island. The three cultivars selected for treatment were: "Sharry Baby", "Silver Chalice" and "Hirota White". The herbicides were applied at two rates, the anticipated labeled use rate (1X) and two times the anticipated labeled use rate (2X). The herbicides evaluated in this experiment were: Direx 4L (diuron), Gallery (isoxaben), Spartan (sulfentrazone) and Surflan (oryzalin). Herbicide applications were directed to the base of plants to avoid direct contact with leaves and flowers. The first herbicide application was applied on 12/02/99 with sequential applications made

at 110, 206, 69, 46 and 70 day intervals for a total of 5 sprays. The last herbicide application was made on 01/24/01 and the termination of the experiment for collection of dry weight values is scheduled for 02/27/01 (34 days after the last spray). Analysis of visual observations for plant vigor indicates that Direx 4L and Surflan allowed for crop vigor not significantly different than untreated plants. Gallery and Spartan reduce vigor and appear to be too injurious for commercial use. Analysis of crop dry weight accumulation will provide a more comprehensive measure of orchid response to sequential herbicide applications.

Objective 2. Continue the currently installed herbicide studies with postemergence herbicides in orchids. Initiate post emergence screening with anthurium cultivars.

Postemergence herbicides applied to 7 potted orchids of varying size:

An experiment to determine the response of 7 orchid cultivars to sequential postemergence herbicide applications was conducted at Polynesian Orchids and Anthuriums Inc. (owner Leland Anderson) located in Kurtistown on the Big Island. The orchid cultivars selected for treatment in this experiment ranged in size from seedlings in 72-cell trays ("UH 306", "UH 800" and "Sharry Baby") to mid-sized flowering plants in 4 inch pots ("Gower Ramsey" and "Hiang Beauty") to mature production plants grown in 6 inch pots for cut flowers ("Houserman White" and "Barbara Mull x Midas Touch", both Phalanopsis). The herbicides evaluated in this experiment were Direx 4L, Lontrel (clopryralid) and Aim (carfentrazone). The herbicides were applied at two rates, the anticipated labeled use rate (1X) and two times the anticipated labeled use rate (2X). Spray applications were made directly to crop foliage using a spray to wet application that was calculated to be 100 gallons per acre. The first application was applied on 11/11/99 with sequential applications made at 20, 208, 73 and 69 day intervals for a total of 5 sprays. Visual injury ratings were made during the course of the experiment and on 12/04/00 the experiment was terminated and all plants were collected for dry weight accumulation.

The first spray injury rating indicated that Aim was too phytotoxic to be useful on orchids and no additional applications of this herbicide were made. A visual rating made 31 days after the third spray application indicated that Direx 4L sprays caused only slight injury to the larger potted orchids and "Sharry Baby" in the 72 cell trays. "UH 306" and "UH 800" showed moderate injury to Direx 4L sprays. "UH 800" showed more injury than "UH 306" in response to Lontrel sprays, while "Sharry Baby" was the least sensitive. In the larger plants, the dendrobium "Hiang Beauty" responded to Lontrel applications with twisting pseudo stem growth. Both Phalanopsis and "Gower Ramsy" showed only slight injury in response to Lontrel sprays.

The plant samples collected for dry weight analysis were not ready for measurement at the time that this report was composed. However, the data collected so far indicates that Direx 4L will be useful for postemeregence weed control in potted orchids ranging from small seedlings to larger plants grown for cut flower production.

Postemergence herbicides applied to 4 potted orchids:

An experiment to determine the response of 4 orchid cultivars to sequential postemergence herbicide applications was conducted at Newman's Nursery in Pahoa on the Big Island. The orchid cultivars selected for treatment in this experiment were potted up in 4 inch pots used to finish the crop for sale. The cultivars used were:"Emma White" (Dendrobium), Wildcat "Blood Ruby", "Volcano Queen" (both Oncidiums) and "SuFun Beauty" (Vanda). The herbicides evaluated in this experiment were Direx 4L and Lontrel. The herbicides were applied at two rates, the anticipated labeled use rate (1X) and four times the anticipated labeled use rate (4X). Spray applications were made directly to crop foliage using a spray to wet application that was calculated to be 100 gallons per acre. The first application was applied on 11/11/99 with sequential applications made at 20, 208, 73 and 69 day intervals for a total of 5 sprays. Visual injury ratings were made during the course of the experiment and on 12/04/00 the experiment was terminated and all plants were collected for dry weight accumulation.

The cultivar "Emma White" showed slight injury to Direx 4L sprays at the 2 and 4X rates of application. The other 3 cultivars showed no noticeable injury to Direx 4L spray applications. The only orchid cultivar to show abnormal growth to Lontrel applications was "Emma White", expressed as J-shaped flower spikes and deformed flowers. The other three cultivars did not show any noticeable injury in response to any of the spray applications.

The plant samples collected for dry weight analysis were not ready for measurement at the time that this report was composed. However, the data collected so far indicates that Direx 4L will be useful for postemeregence weed control in potted orchids with a safety factor of 4. This means that a spray application 4 times stronger than the anticipated labeled rate will not cause noticeable injury to 3 of the 4 orchid cultivars in this experiment. Lontrel injury on "Emma White" and the lack of weed control activity on artillery fern may be reason to drop this herbicide from continued study.

Postemergence herbicides on 4 anthurium cultivars.

An experiment to determine the response of 4 potted anthurium cultivars to sequential postemergence herbicide applications was conducted at Green Point Nursery. The four cultivars selected for treatment were "Lady Ann", "Sundial", "Tropic Fire", and "Nicoya". The herbicides were applied at two rates; the anticipated labeled use rate (1X) and four times the anticipated labeled use rate (4X). The herbicides evaluated in this experiment were Direx 4L (diuron) and Lontrel (clopyralid). Herbicide applications were applied directly to crop foliage using a 100 gallon per acre rate of application. The first application was applied on 05/05/00 with sequential applications made at 52, 72, 70 and 70 day intervals for a total of 5 sprays. Visual injury ratings were made through out the course of the experiment. The experiment is scheduled to terminate on 03/21/01, 59 days after the last spray application. Each plant will be collected for measurements of growth and dry weight accumulation.

Analysis of visual injury ratings indicated that cultivars differ in their response to the herbicide treatments. "Tropic fire" consistently showed a 10-20 % leaf tissue injury to Direx at the 4X rate two weeks after spray application. Once injured leaves were dropped, no subsequent injury appeared. "Sundial" was less affected than "Nicoya" and "Lady Ann". Lontrel cause little to no injury to anthurium foliage at any rate and all cultivars responded in a similar way. Crop dry weight will provide a more comprehensive measure of the response of these cultivars.

With only visual observations available at the time this report was composed, some tentative conclusions can be made. All cultivars are tolerant of Lontrel at the 1X use rate with an excellent margin of safety. The anthurium cultivars used in this experiment showed varying sensitivity to Direx applications. "Nicoya" appears to be the most resistant to direct spray application while "Tropic Fire" the least. "Sundial" and "Lady Ann" were not injured by the 1X rate of Direx but at 4X, Lady Ann showed some foliar damage that was numerically higher than the injury exhibited by Sundial. These data indicate that Direx and Lontrel can both be used in anthuriums but cultivar sensitivity to Direx may require special labeling for commercial users.

Objective 3. Expand the number of orchid and anthurium cultivars exposed to postemergence herbicides.

Postemergence herbicide demonstration on 83 potted orchid cultivars:

A commercial scale demonstration was conducted on 83 cultivars of potted orchids at Newman's Nursery in Pahoa on the Big Island. The owner of the farm, Jeff Newman, agreed to conduct a demonstration of Direx 4L postemergence spray application in one of his covered production houses. Jeff did the actual spraying with assistance and calibration by J. DeFrank. The spray application was made across the entire saran house using a two nozzle boom powered with a gasoline pump that pulled a finished spray of Direx 4L from a 35 gallon plastic trash can. Nine ounces of Direx 4L was mixed to final volume of 30 gallons. Jeff was calibrated to apply 50 gallons per acre.

The demonstration began on May 8, 2000. Dr. DeFrank returned on May 25 & 26 to make visible ratings of the crop response and to record the size of plants treated. A very wide range of plant sizes was treated. Plant size ranged from 2-3 inch seedlings to fully mature 8-12 inch flowering plants. The visual rating made 17 days after spraying indicated that all cultivars were either unaffected or showed some slight injury. Cultivars in the list below with number 46-52 appeared to have flower bud abortion. Jeff Newman indicated that this might be due to the spray or over fertilization. Weeds were present in this demonstration and a % control rating was also taken. At 17 days after spraying 90-95% of treated artillery fern was drying up and dying. Oxalis was only partially controlled with only 15% of treated foliage showing yellowing and dry foliage and about 50% of the treated population showing wilting.

ORCHID CULTIVARS TREATED WITH DIREX 4L IN ON FARM DEMONSTRATION AT NEWMAN'S NURSERY

Name recorded in field	Hybrid name	Parentage per label
1. Dgmra, WonderlanD 'White Fairy'	Miltonidium (Mtdm.) Issaku Nagata	
2. Bak.Truth 'SilverChalice'	Miltonidium (Mtdm.) Issaku Nagata	
3. Milt. Warscewiczii X Onc. Leucochilum	Miltonidium (Mtdm.) Issaku Nagata	Milt. warscewiczii X Onc. leucochilum
4. Onc. Sharry Baby cv.'Sweet Fragrance'	Oncidium (Onc.) Sharry Baby 'Sweet Fragrance'	
5. Mtdm 'Bartley Schwartz'	Miltonidium (Mtdm.) Bartley Schwarz	
6. Colm. Wildcat 'Blood Ruby'	Colmanara (Colm.) Wildcat 'Blood Ruby'	
7. Bllra. Marfitch 'Howard's Dream' AM/AOS	Beallara (Bllra.) Marfitch 'Howard's Dream' AM/AOS	
8. Colm. Wildcat 'Doris'	Colmanara (Colm.) Wildcat 'Doris'	
9. Dgmra. 'Flying High Stars and Bars' HCC/ADS	Degarmoara (Dgmra.) Flying High 'Stars and Bars' HCC/AOS	
10. Odcm Golden Trident 'Golden Gate'	Odontocidium (Odcdm.) Golden Trident 'Golden Gate'	
11. ODBRS.Kevin Biven'Santa Barbara' HCC/ADS	Odontobrassia (Odbrs.) Kenneth Bivens 'Santa Barbara' HCC/AOS	
12. Alcra. Sunday Best cv. 'Muffin'	Aliceara (Alcra.) Sunday Best 'Muffin'	
13. Colm. Wildcat 'Bobcat'	Colmanara (Colm.) Wildcat 'Bobcat'	
14. Colm. Wildcat 'Carmela'	Colmanara (Colm.) Wildcat 'Carmela'	
15. BRS. REX 'SAKATA'	Brassia (Brs.) Rex 'Sakata'	
16. Colm. Wildcat 'Taida'	Colmanara (Colm.) Wildcat 'Taida'	
17. D. Tokiko Inuba X D. Tora Ohashi		Den. (Tokiko Inaba X Tora Ohashi)
18. Onc. Sweetsugar 'Emperor'	Oncidium (Onc.) Sweet Sugar 'Emperor'	
19. D. Lim Chong Min X D. Formosum	Den. Golamco's Favorite	Den. (Lim Chong Min X formosum)
20. D. Sunan Blue X D. Classic Gem		Den. (Sunan Blue X Classic Gem)
21. D. Jaquelyn Concert X D. Thailand	Den. Roi-Et	Den. (Jaquelyn Concert X Thailand)
22. D. Thoncchai Gold X D. Chaisri Gold	Den. Burana Gold	Den. (Thongchai Gold X Chaisri Gold)
23. D. Banyad Pink X D. Burana Stripe		
24. D. Kannayao Red		
25. D. SAKURA PINK		
26. Onc. Lanceaum x Maui Gold	Oncidium (Onc.) Nathakhun	
27. D. Udom Blue Angel x D.		Den. (Udom Blue Angel

Tubtim Velvet		X Tubtim Velvet)
28. Pinawatlana No. 4		
29. D. Chao Praya Blue #2		
30. D. Tokiko Inaba X D. Thailand		Den. (Tokiko Inaba X Thailand)
31. D. Roi-et X D. Mollisa Beauty # 2		Den. (Roi-Et X Mollisa Beauty)
32. D. Hirota White	Den. Hirota White	
33. D. Burana Fancy X D. Madame Uraiwan	Den. Burana Wan	Den. (Burana Fancy X Madame Uraiwan)
34. D. Queen Southeast X D. Tora Ohashi		Den. (Queen Southeast X Tora Ohashi)
Name recoreded in field	Hybrid name	Parentage per label
35. D. Durana Green x D. Uraiwan		Den. (Burana Fancy X Madame Uraiwan)
36. D. Burana Green x D. Madame Vipa		Den. (Burana Green X Madame Vipa)
37. D. Burana Sunshine	Den. Burana Sunshine	
38. D. Burana Fancy 'Udom Green #2'	Den. Burana Fancy 'Udom Green #2'	
39. Pot. Niti		
40. HKNSA. Sogo Doll 'Little Angel' am/osroc	Hawkinsara (Hknsa.) Sogo Doll 'Little Angel' AM/OSROC	
41. BLC. Toshie Aoki x LC. 'Brazilian Treasure'		Blc. (Toshie Aoki X Lc. Brazilian Treasure)
42. BLC. Chong Guu Chaffinch 'Ta-hsin'	Blc. Chyong Guu Chaffinch 'Ta-Hsin'	
43. Cookara Tropical Snowflake 'M'	Cookara (Cook.) Tropical Snowflake 'M'	
44. BLC. GOLD TANG D.	Blc. Golden Tang	
45. CTNA Why Not Roundabout x Self		Cattleytonia (Ctna.) Why Not 'Roundabout' X self
46. BLC Ports of Paradise '666' FCC	Blc. Ports of Paradise 'Gleneyrie's Green Giant' FCC/AOS	
47. EPLC.MAE BLY 'EMY' BM/JOGA	Eplc. Mae Bly 'Emy' BM/JOGA	
48. BLC.Young Hong 'Sun #16'	Blc. Young Kong 'Sun#16'	
49. BLC. Chia Lin 'Sun'	Blc. Chia Lin 'Sun'	
50. LC. South Esk 'Catherine'	Lc. South Esk 'Catherine'	
51. BLC. Shin Fong Louhyang 'Emperor'	Blc. Shinfong Luohyang 'Emperor'	
52. LC. Pha Nakhon Khiri C. Netrasiri Beauty		

53. BLC. Goldenzelle 'Lemon Chiffon'	Blc. Goldenzelle 'Lemon Chiffon'	
54. LC. Velitold Carmen x Drumbeat		
55. BLC. Jiuhbao Rainbow 'Jiuhbao Beauty'	Blc. Jiuhbao Rainbow 'Jiuhbao Beauty'	
56. Pot. Haw Yuun Gold U.K. #2	Pot. Haw Yuan Gold 'Y.K. #2'	
57. BLC. Chyong Gun Chaffinch 'Tu-hsin	Blc. Chyong Guu Chaffinch 'Ta-Hsin'	
58. SC. Cosmos 'Lea' AM/ADS	Sc. Cosmos 'Lea' AM/AOS	
59. Pot. Thiti 'Volcano Queen'		
60. BLC. Vichitr Gold x Rattanakosin 'Lakeland'		Blc. (Vichitr Gold X Rattanakosin) 'Lakeland'
61. BLC. Phaileong x LC. Waianae Sunset VQ		Lc. (Phai-loeng X Waianae Sunset)
62. BLC. Netrasiri Green Peace X BLC. Green Bay		Blc. (Netrasiri Green Peace X Green Bay)
63. BLC. Toshie Aoki 'Pizazz'	Blc. Toshie Aoki 'Pizazz'	
64. BLC. Ports of Paradise 'Emerald Isle'	Blc. Ports of Paradise 'Emerald Isle'	
65. POT. Free Spirit 'Lea' AM/AOS	Pot. Free Spirit 'Lea' AM/AOS	
66. BLC. Dorcille Little x C. Interglossa 'Sa-Ngob'		
67. BLC. Ronald Hauserman x LC. Waianae Sunset		
68. BLC. Chia Lin 'New City'	Blc. Chia Lin 'New City'	
69. LC. Irene Finney 'Chicago' HCC/AOS	Lc. Irene Finney 'Chicago' HCC/AOS	
70. LC. SoutH Esk 'Catherine'	Lc. South Esk 'Catherine'	
71. LC. Irene Finney 'Spring Beauty' AM/AOS	Lc. Irene Finney 'Spring Beauty' AM/AOS	
Name recoreded in field	Hybrid name	Parentage per label
72. LC. Phra Nakhon Khiri C. Netrasiri Beauty		
73. SLC. Wendy's Valentine 'June'	Slc. Wendy's Valentine 'June'	
74. BLC. Vichtri Gold x Rattana Kosin 'Lakeland'	Blc. (Vichitr Gold X Rattanakosin) 'Lakeland'	
75. POT. Hisako Akatsuka 'Volcano Queen' HCC/AOS	Pot. Hisako Akatsuka 'Volcano Queen' HCC/AOS	
76. BLC. Hunting Isalnd' Hawaii'	Blc. Hunting Island 'Hawaii'	
77. LC. Casitas Spring 'Linden' AM/AOS	Lc. Casitas Spring 'Linden' AM/AOS	
78. BLC. Fred Stewart x LC. Drumbeat 'Volcano Queen'	Blc. Magic of Mishima	Blc. (Fred Stewart X Lc. Drumbeat 'Volcano Queen')

79. PAPH. Liemianum #1 x PHAP. Philippinese #10	Paph. Jolly Holiday	Paph. (liemianum '#1' X philippinense '#10')
80. PAPH (Makuli-Curtisii)-Maudiae x PHAP. Maudiae 'Napa Valley'		
81. Culm. Wildcat 'Leopard'	Colmanara (Colm.) Wildcat 'Leopard'	
82. Culm. Wildcat 'Ocelot'	Colmanara (Colm.) Wildcat 'Ocelot'	
83. MTOM. PUPUKEA SUNSET	Miltonidium (Mtdm.) Pupukea Sunset	

Objective 3, con't.

Postemergence herbicides on 10 orchid cultivars in the seedling stage:

An experiment to determine the response of 10 orchid cultivars in the seedling stage to sequential postemergence herbicide applications was conducted at the Waianae location of Hawaii Rainbow Orchids (owner Creighton Mow). The orchids selected for this experiment included 9 Dendrobiums and 1 Vanda. At the beginning of the experiment, seedling age from culture flasks ranged from 57 to 117 days. The dendrobium orchids used in this experiment were: "D. Bangsaen Beauty Udomsri", (#2716), "D. Vipa Mary MR x D. Udom Flare X D. Kanokporn" (#2701), "D. Burana Jade", "D. Jacky mutation" (WRM 303), "D. Sakura Pink", "D. Bertha Chung X Imelda Romualdez `Blue" (224), "D. Thoung `Pink", "D. Kannayao Red" (392), "D. Woor Leng X D. Pathum Thani". The only vanda selected for this experiment was Vanda "D.K. Hybrid". Direx 4L was the only herbicide used in this experiment and was applied at 1 and 4X (the anticipated labeled use rate (1X) and four times the anticipated labeled use rate). Spray applications were made directly to plant foliage using a 100 gallon per acre application rate. The first application was made on 04/27/00 with sequential applications made at 50, 21, 70, and 66 day intervals for a total of 5 sprays. Visual injury ratings were made during the course of the experiment and on 12/20/00 the experiment was terminated and all plants were collected for dry weight accumulation.

Visual ratings made during the course of the experiment consistently indicated that Direx 4L spray applications caused little to no injury to all cultivars of these small seedlings. All cultivars were consistent in their response to the spray applications. Dry weight accumulation indicated that the 1X rate of Direx 4L did not reduce growth and was numerically higher than untreated plants. Plants treated with the 4X rate of Direx were significantly lower than those in the 1X rate but not untreated plants. These data will support Direx 4L applications to very small plants and should provide added support for labeling use on orchids without designating each individual cultivar.

Objective 4. Compare the safety, effectiveness and longevity of two preemergence delivery systems, conventional over the top sprays and herbicides bound to cinders (HOT CINDERS) used as a top dress or mixture in pots of orchids.

In this experiment, a cement mixer was used to treat growth media with preemergence herbicides prior to their use in pots. The potting component treated with various herbicides was cubed coconut fiber referred to commercially as coir. The herbicides used to treat the coir were Direx 4L, Surflan and Gallery as a mixture and Ronstar WP. The treated coir was used in two ways as a potting mix component, as a top dressing mulch after the crop was planted and as 50% mixture with volcanic cinder. The herbicides used to treat coir in the cement mixer were also applied as a directed spray application upon a 50% mixture of coir and cinder. The treatment designed allowed comparison of three ways to deliver the herbicide dose, i.e. treated coir as surface topdress, treated coir as potting component and as a conventional directed spray application. Also included in the treatment set was Ronstar in a granular formulation. All chemical treatments were applied at two rates, the anticipated labeled use rate (1X) and four times the anticipated labeled use rate (4X). This treatment set was used in two separate experiments. An experiment to evaluate only weed control activity was setup at Polynesian Orchids and Anthuriums Inc. Another experiment was setup at Newman's Nursery and included 3 orchid cultivars , "Ocelot", "D. Roi ET – D. Doctor Poyck #325" and "D. Burana Green". The orchids were removed from common trays and potted up in 4 inch pots and grown in a commercial production environment. The weed control experiment was set on the anthurium cinder beds in a saran house receiving both natural rainfall and overhead irrigation. The weed control experiment started on 05/03/00 and the orchid experiment started on 05/04/00.

The weed control experiment was spoiled when herbicides were sprayed over the anthurium beds contaminating all treatments. It was apparent that something was wrong early in the experiment when weeds in the untreated pots would emerge in a flush and then die off (symptomatic of diuron activity). The orchid experiment worked out much better except for a lack of fertilization to maintain commercially acceptable vigor of the orchids. The orchids were visually rated for vigor on 12/05/00, 215 days after planting. Although the treatment set is complex some conclusions can be made. The mixture of Surflan and Gallery reduced vigor of all cultivars with "Ocelot" being the most sensitive. Orchids in Direx treatments appeared less vigorous than those in Ronstar treatments. There was not a significant reduction of orchid vigor between 1X and 4X levels of herbicides.

On 01/24/01 a visual rating of moss growth in the orchid experiment was recorded. Moss was not well controlled with Direx 4L and moderately improved with the Surflan/Gallery mix. Ronstar WP applied with all three delivery methods provided excellent control of moss. Ronstar applied in a granular formulation did not control moss. These data suggest that a combination of Direx 4L and Ronstar WP applied either as a potting component or as a spray application can provide a wider spectrum of weed control than either chemical alone. Conclusions on orchid response to these treatments are tentative due to a lack of fertilization and poor vigor in all treatments.

CHEMCIAL WEED CONTROL FOR EXPORT GRADE POTTED ORCHIDS AND ANTHURIUMS.

Submitted by Dr. Joe DeFrank (Feb. 2001), UH-Manoa.

Plan of Work for 2001

The research initiated in 2000 provided some excellent results and points the way for continued efforts. Direx 4L has been clearly identified as a useful post and preemergence herbicide for weed control in potted orchids. The on farm demonstration provided a good indication of the wide range of growth stages and cultivars tolerant to the anticipated use rate. In anthuriums both Direx and Surflan appear to be safe as preemergence herbicides on the cultivars tested. Direx 4L used as a postemergence spray in anthuriums has revealed cultivar dependant sensitivity. The Hot Cinder concept in orchids has shown Ronstar to be a very useful tool for moss control. The data generated in 2000 is the basis for the proposed plan of work for 2001.

Objective 1. Complete the analysis of the currently obtained data on chemical weed control for potted orchid and anthuriums and submit final reports to participating chemical companies.

Procedures of Objective 1. The research conducted to date is briefly summarized in the progress report found prior to this section. A complete analysis of all the visual injury rating and dry weight data will be used to write reports submitted to chemical company representative responsible for new and expanded label uses. Dr. DeFrank will work closely with these people to make sure they have all the information they need to consider expanded usage of their products on Hawaii's exported flower crops.

Objective 2 . Continue the currently running Hot Cinder experiment on orchids. Initiate Hot Cinder experiments on anthuriums and orchids using a herbicide mixture of Direx 4L and Ronstar WP.

Procedures of Objective 2. The orchid experiment at Newman's Nursery was started in May 2000. The experiment needs to continue until a marketable plant is produced in the untreated units (Aug-Sept. 20001). A comprehensive analysis of the visual and dry weight data will provide a detailed response of the orchids to herbicides applied either as a directed preemergence spray or as a pretreated component of the potting mix. The currently available data suggest that Direx combined with Ronstar can provide control of difficult weeds like moss and artillery fern when attached to coir used in the potting mix. If the mixture is safe, in terms of orchid growth, then expanded studies will need to include more cultivars used in the export market. Also, initiate Hot Cinder Study on 1 or more anthurium cultivars.

Objective 3. Initiate replicated experiments to expand the number of orchid cultivars exposed to sequential applications of Direx 4L postemergence spray applications.

Procedures of Objective 3. In the research conducted to date 21 cultivars have been exposed to sequential applications of the anticipated use rate of Direx 4L as a postemergence herbicide. These cultivars were not adversely affected by the use rate with only slight growth reductions at higher rates. Replicated experiments need to be continued on more cultivars that represent the widest use in the exported orchid market. The currently available data will be submitted to Griffen Chemical Co. to support legal use for cultivars currently known to be tolerant to Direx 4L postemergence applications.

Objective 4. Initiate replicated experiments to expand the number of anthurium cultivars exposed to sequential applications of Direx 4L postemergence spray applications.

Procedures of Objective 4. Four anthurium cultivars have been have been exposed to sequential applications of the anticipated use rate of Direx 4L as a postemergence herbicide. It is clear that cultivars vary in their resistance to these applications. It will be necessary to characterize each cultivar's sensitivity to Direx before being added to the products label. Grower will need to identify all cultivars intended for use as exported plants and then these must be tested for Direx sensitivity. Experiments will be initiated with cultivars exposed to sequential applications of Direx 4L using 70 day intervals with a total of at least 5 applications/yr.

Time line.

To make the proposed research directly applicable to our growers, all experiments will be conducted on active farms. A timetable is presented for the 3rd year project.

Month of project	Objectives addressed	Narrative
1-9	1,2	Submit reports and continue Hot Cinder study on orchids. Start Hot Cinder Study with anthuriums
4-12	3,4	Initiate expanded cultivar exposure of orchids and anthuriums to Direx 4L postemergence sprays. Continue sequential applications.

Budget:

Item	Costs
APT II(.5 FTE)	15,785.00
Fringe Benefits (27.17%)	4,289.00
Travel Domestic only	2,000.00
Cost for damaged plants	2,000.00
Materials & Supplies	1,500.00
Total	25,574.00

Results will be provided to growers in the form of a written report. An oral presentation with slides will also be provided to allow for viewing of results and asking questions. Examples of past presentation of results is documented below:

1. DeFrank, J. 1993. Response of newly planted seashore paspalum to oxadiazon. Hawaii Landscape Industry News:7(2) 23.

2. DeFrank, J., T. Higaki, J. Imamura and V.A. Easton-Smith. 1989. Response of anthurium and weeds to 4 preemergence herbicides. HortScience 24(6):1044.

3. DeFrank, J. and V. A. Easton-Smith 1990. Evaluation of preemergence herbicides on four protea species. Tropical Agriculture 67(4): 360-362.

4. DeFrank, J. 1995. Azolla for Weed Control in Wetland Taro Production. Video Series:047