the low rates of Dyrene (1/2 lb) and Difolatan 4 Flo (1 1/2 pts). The check sub-plot sprayed only with Nu Film 17 had significantly lower per cent disease than the unsprayed check sub-plot (Table 1).

In the harvest of October 14 there were no significant differences (5% level) between fungicides in average yield of whole plots. Average yield differences between the sub-plots sprayed with and without Nu Film 17 were significant. The average per cent of yield of the check sub-plot with Nu Film 17 was higher than the unsprayed check sub-plot (Table 1).

By November 21, 7 days after the first harvest, the yields had been drastically reduced. The vines of the plots sprayed only with fungicides were severely spotted and had lost most of their leaves. The differences in yield between the fungicides were not significant (5% level), but the differences between the sub-plots with and without Nu Film 17 were significant at the 5% level. Neither check sub-plots yielded any cucumbers.

In the third harvest of November 26, only the plots sprayed with the combination of fungicides and Nu Film 17 yielded any cucumbers. The plots sprayed with fungicides alone had no cucumbers because the vines were dead. No statistical calculations were possible due to the lack of yield from half of the plots.

Results presented herein suggest that when infection is light, Nu Film 17 appeared to have no significant effect on the fungicidal sprays. With an increase in disease all the plots sprayed with fungicide and Nu Film 17 combinations had better foliage with less disease than the plots sprayed with fungicides alone. All of the low rates of fungicides had increased per cent disease control of target spot when sprayed in combination with Nu Film 17 than when sprayed alone, and also a higher per cent disease control than the high rates of fungicides without Nu Film 17.

It is suggested that a test more comparable with commercial practices would have been to spray at much shorter intervals than 7 days, after target spot had been observed. Continued spraying at a 7-day cycle allowed the disease to become epiphytotic and eventually defoliated all the plots.

The occurrence of less disease and greater yield in the plots sprayed only with Nu Film 17, and the increase in yield cannot be explained. Similar results have been observed in other tests with Nu Film 17 but have not been fully studied to determine their course. It has been suggested that a lowered transpiration rate may be one of the factors involved.

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PHYTOTOXICITY TO PURPLE NUTSEDGE (Cyperus rotundus L.) AND SOIL PERSISTENCE OF SOME HORMONE TYPE HERBICIDES

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ABSTRACT

Foliar sprays of seven forms of 2,4-dichlorophenoxyacetic acid, two morphactin mixtures + 2,4-D, and paraquat applied to 2-week-old purple nutsedge (*Cyperus rotundus* L.) plants produced chlorotic and/or necrotic foliage in 2 weeks at which time treatments were rototilled. Spray treatment, plant counts, and cultivation were repeated twice at monthly intervals. Bioassay for soil residue was made at approximately 2-week intervals. All compounds evaluated were effective and reduced the stand of purple nutsedge 75 to 85 percent with 3 sprays. Only the 2,4-D acid, 2,4-D sodium salt and the mixture of

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dodecyl and tetradecyl salts of 2,4-D showed detectable residue 14 days after treatment.

Introduction and Literature Review

Purple nutsedge, *Cyperus rotundus* L., native to the tropics, is a major problem in cultivated lands in almost every warm region of the world. A large volume of information has been amassed on this perennial weed since 1942. There is probably no other single weed species on which the results of so many applied and basic studies have been reported. The physiology and morphogenesis of the species in all phases of its life cycle have been thoroughly investigated and the literature reviewed by Loustalot *et al* (5). In 1949 and again in 1961 (1,2) the author reported on the results of trials with sodium 2,4-dichlorophenoxyacetic acid (2,4-D) for control of purple nutsedge. As a result of these studies, Burgis (3) in 1951 recommended repeated applications of 2,4-D combined with cultivation as an effective control measure. The recommendation is presently being followed by growers in Florida.

This study was conducted to determine the herbicidal effectiveness of seven modern forms of 2,4-D and other herbicides to purple nutsedge and the persistence of the chemicals in the soil.

Materials and Methods

On August 7, 1968 a series of plots was established in a randomized block design with 3 replications on a sandy soil heavily infested with purple nutsedge. The Leon fine sand soil had percentages of sand, silt, and organic matter of 96.5, 0.9, and 2.6, respectively. The soil had a cation exchange capacity of 8 meq per 100 gms and a moisture equivalent of 7.5%. Each replicate plot was 15 by 16 feet (240 sq ft). The experimental area was irrigated by open-seep ditches.

All phenoxy and morphactin chemical treatments were applied broadcast at the rate of 4 lb active ingredient in 100 gal/A water with a knapsack sprayer using approximately 40 psi of pressure and a single 80° (8002) Tee-Jet nozzle. The phenoxy chemicals evaluated were: N-oleyl-1-1, 3-propylenediamine salt of 2,4-dichlorophenoxyacetic acid (2,4-D oil-soluble amine), butoxyethanol ester of 2,4-dichlorophenoxyacetic acid (ethanol ester), dimethylamine salt of 2,4-dichlorophenoxyacetic acid (2,4-D dimethyl amine), sodium salt of 2,4-dichlorophenoxyacetic acid (2,4-D sodium salt), 2,4-dichlorophenoxyacetic acid (2,4-D acid) and a mixture of dodecyl and tetradecyl amine salts of 2,4-dichlorophenoxyacetic acid (do + tetradecyl amine). In one treatment a polysaccharide gum mixture (PGM) was used with oil-soluble amine at 4 lb per 100 gal of water and also in 20 gal of water. The morphactins tested were: N-butyl-9-hydroxyflourene-(9)-carboxylate (TH 407-H) and Methyl 2-chloro-9-hydroxyflorene-(9)-carboxylate (TH 417-H). These were formulated at the rate of 2 lb of 2,4-D (ester) + .75 lb. morphactin per gallon. Three pints of these mixtures were used per acre/plot. Another treatment consisted of 1 pt. of paraquat, 1:1-dimethyl-4, 4'-dipyridilium dichloride, + 2 gal of emulsifiable oil in 100 gal/A water.

The experimental procedure used involved: (a) treatment; (b) rototilling two weeks later to a depth of 5 inches; and (c) still two weeks later of making nutsedge plant counts in three 1-square foot areas taken at random. This required 4 weeks, at which time the cycle was repeated (see Table 1).

To determine the persistence of toxic amounts of each chemical the plots were bioassayed two (prior to rototilling) and four (prior to re-treating) weeks after treatment. Bioassay methods were those used by Hammer *et al* (4). Each bioassay sample consisted of four 2-inch deep cores taken at random from the soil surface with a 3/4 inch diameter soil sampling tube, mixed together and pressed into a 3 and ½ oz paper cup. Two bean (*Phaseolus vulgaris* L.) seeds

Table 1. Schedule of herbicide applications, bioassay samplings, cultivations and plant counts for 1968 summer and fall nutsedge test.

	Significant dates								
	August		September			October		November	
	7	20	3	11	25	23		4	28
First application	X								
2 wk bioassay		X							
Rototilled		X							
4 wk bioassay			X						
First plant count			X						
Second application			R	X					
2 wk bioassay					X				
Rototilled					X				
4 wk bioassay				H	R	X			
Second plant count						X			
Third application						X			
2 wk bioassay								X	
Rototilled								X	
4 wk bioassay									X
Third plant count									X

R = Rain
H = Hurricane

Table 2. Effectiveness of 2,4-D and other herbicides in reducing stand of nutsedge as determined by field counts

	% nutsedge control	
	1st treatment	3rd treatment
1. Check, cultivated	0	0
2. 2,4-D oil-sol amine	55	79
3. 2,4-D oil-sol amine + PGM	71	76
4. 2,4-D oil-sol amine 1.	79	88
5. 2,4-D oil-sol amine + PGM	78	85
6. 2,4-D ethanol ester	66	82
7. 2,4-D acid	42	74
8. 2,4-D dimethyl amine	78	85
9. 2,4-D sodium salt	57	74
10. 2,4-D dodecyl + tetradecyl amine	75	74
11. 2,4-D triethanol amine	75	83
12. Morphactin + oil (TH407-H)	61	82
13. Morphactin + oil (TH417-H)	74	84
14. Paraquat + oil	65	78
LSD 1% level	19	12

1. treatments 4 and 5 were applied as low gallonage sprays (20 gpa) whereas all other treatments were applied as high gallonage sprays of 100 gallons per acre.

were planted in each cup and watered with 20 cc of distilled water. The heights of the bean plants were measured after a 10 day growth period in the greenhouse.

Results and Discussion

Within two weeks after application of the first treatments of phenoxy compounds and morphactin the nutsedge foliage had turned yellow. At this time all treatments appeared to be effective. Bioassay soil samples were taken and the plots were rototilled. Two weeks after rototilling a new crop of vigorously growing nutsedge had emerged in the plots and counts were made and bioassay samples taken. Because of excessive rainfall, retreatment (see Table 1) was delayed one week. It had been hoped that the experiment could be conducted on a 28 day schedule as outlined. However, an abnormally wet summer plus a hurricane on October 17, 18 and 19 made this impossible. The actual dates of treating, bioassaying, rototilling and making plant counts are shown in Table 1.

In general, the reduction in nutsedge stand as a result of chemical treatment with the seven forms of 2,4-D was consistent with that previously reported (3) for the sodium salt (Table 2). Generally the 2,4-D acid and sodium salts gave inferior results for all 3 treatments. The low gallonage rate of oil-soluble amine applied without the thickener PGM was significantly better than the acid, sodium salt, or do + tetradecyl amine.

Table 3. Persistence of herbicides in the soil as determined by the growth response of beans in terms of plant height (cm).

	Bean bioassay[1] 2 wks after treatment Herbicide application				Bean bioassay[1] 4 wks after treatment Herbicide application				Total[2] effect
	1st	2nd	3rd	Sum	1st	2nd	3rd	Sum	Sum
1. Check, cultivated	41.6	27.8	24.6	94.0	28.2	21.7	25.4	75.3	169.3
2. Oil-sol amine	36.1	31.6	19.6	87.3	25.1	21.0	20.0	66.1	153.4
3. Oil-sol amine + PGM	30.7	32.6	23.3	86.6	27.9	14.9	17.7	60.5	147.1
4. Oil-sol amine[3]	44.8	39.0	21.7	105.5	25.6	18.2	21.3	65.1	170.6
5. Oil-sol amine + PGM	49.0	29.4	24.2	102.6	28.9	20.8	18.8	68.5	171.1
6. Ethanol ester	40.5	34.5	21.7	96.7	26.9	18.9	19.7	65.5	162.2
7. Acid of 2,4-D	16.7*	31.5	18.7	66.9	26.0	16.7	19.4	62.1	129.0*
8. Dimethyl amine	31.2	35.5	20.8	87.6	27.9	19.6	16.0	63.5	151.1
9. Sodium salt	29.6*	29.1	19.7	78.4	21.7	19.3	19.1	60.1	138.5*
10. Do + tetradecyl amine	9.0*	26.5	23.6	59.1	28.4	18.3	22.7	69.4	128.5*
11. Triethanol amine	34.9	30.9	24.1	89.9	30.1	18.1	10.4*	58.6	148.5
12. TH 407-H + oil	39.4	35.4	21.8	96.6	29.7	26.0	25.3	81.0	177.6
13. TH 417-H + oil	38.9	29.5	19.8	88.2	24.4	19.5	22.4	66.3	154.5
14. Paraquat + oil	35.7	29.8	19.2	84.7	24.4	16.3	25.6	66.3	151.0

1. Starred treatments are significantly poorer than untreated plots at 5% level (LSD = 11.3).
2. Starred treatments are significantly poorer than untreated plots at 1% level (LSD = 27.7).
3. Treatments 4 and 5 were applied as low gallonage sprays of 20 gallons per broadcast acre whereas other treatments were applied of high gallonage sprays of 100 gallons per acre.

tetradecyl amine for the 3rd treatment. The addition of the thickener did not make a significant improvement in the effectiveness of the oil-soluble amine regardless of the gallonage rate for either the first or second treatments (Table 2). Morphactin and paraquat treated plots were equally as good as phenoxy treated plots.

A consideration of soil persistence based on total effect (Table 3) shows that the 2,4-D acid, sodium salt and do + tetradecyl amine are significantly more persistent than the other 2,4-D chemicals, but this effect was reflected only in the first 2 weeks bioassay (Table 3). Results from the samples bioassayed 4 weeks after treatment show that chemically treated plots generally exhibited a slight inhibition of growth relative to untreated (check) plots. This is thought to be the result of reduced fresh organic matter in treated plots at the time of the rototilling which resulted in poorer soil aeration, drainage and nitrification processes.

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BLOSSOM REMOVAL IN THE STRAWBERRY WINTER NURSERY

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ABSTRACT

The effect of removing the emerging blossoms from mother plants on plant production in the winter nursery was studied for two seasons. In 1968 the removal of blossoms statistically increased plant production with the clones 113-D5, 'Torrey', La. 1158 and 'Florida 90', and increased plant production with the clones 113-D5, the plant production of all other clones tested. In 1969 each of the clones tested, 'Sequoia', 'Aliso', 'Tioga' and 'Solana', produced significantly more plants when the emerging blossoms were removed. During both years the control plants not only produced fewer plants but also smaller plants.

INTRODUCTION

Plant production is an important consideration to the strawberry industry of Florida. It has been demonstrated that clones differ in their ability to produce daughter plants (1). With the discontinuance of the prolific plant producer 'Florida 90' and the growing importance of California developed clones in Florida, plant production problems have been encountered. Low plant production in Florida of clones developed elsewhere is generally related to their diverse genetic make-up as well as to the environmental differences existing between these areas and Florida (1). It is known that variations in temperature and light affect fruit production as well as plant production (1, 2, 5).

Vegetative growth has been demonstrated to be antagonistic to the flowering and fruiting of the strawberry (6). Fruiting inhibits plant growth by depressing leaf size and area and delays leaf and runner emergence. These inhibitions begin before or soon after flowering not waiting for the fruiting period (3).

Plant production in the more northern areas of this country has been increased by blossom removal. Hand labor is required since efforts to use chemicals as de-blossoming agents have not yet proven satisfactory (4).

MATERIALS AND METHODS

This study involves field trials conducted in 1968 and 1969 at the Strawberry and Vegetable Field Laboratory on a Scranton fine sand. Plants of ten clones ('Solana', 113-D1, 113-D5, La. 1158, 'Tioga', 'Earlibelle', 'Torrey', 'Missionary', 'Florida 90', and 'Dabreak') were transplanted on February 1, 1968 after being held in storage at

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