treated plots of Vorlex-201 and Vorlex and down the center of the in-the-row treated beds. Nutsedge predominated in the surviving weed populations. Weeds on the shoulders of the in-the-row-treated beds were controlled by cultivation.

The broadcast application of Vorlex-201 and Vorlex improved the FPI 107 and 85 percent respectively over that from untreated checks. All treatments with Vorlex and Vorlex-201 improved the flower yield. The quality of the spikes was affected significantly by fumigation. The ratio of the FPI to the percent flower cut indicates that both fumigants applied broadcast improved the quality of the spikes, a factor of 4.4 and 4.2 to 3.1 for the check. A survey of large gladiolus growers in the state led to the conclusion that a 70-75 percent cut of marketable spikes is necessary to begin to show a profit on the flower crop. In the test under discussion the cut in untreated soil check was 67 percent; in that with Vorlex-201 applied broadcast the cut was 101 percent. Corm splitting was responsible for the multiple spikes per corm in the fumigated plots. Though a reduction in quality might have been expected with splitting, such was not the case.

Corm loss due to disease was greatest with in-the-row treatment with Vorlex. There was only a tendency for Vorlex-201 to reduce corm loss; however, corm size was definitely improved where Vorlex and Vorlex-201 was broadcast, .117 and .126 lbs per corm as compared to .080 lbs for the check. Rootknot was not found in representative samples of the corms investigated at the time of digging. The relatively cool spring may have suppressed activity of the rootknot nematode until late in the season. Since these data were taken after the corms were cleaned and graded, it may be assumed that the benefit to corm health could be adjudged a part of the economic benefit accruing from soil fumigation, even though such values were not included in the following crop value calculations.

The zinophos + Thimet treatment failed to increase yield. The percent flower cut was equivalent to that in the untreated chacks. The material did not control nematodes at the rate applied. Early in the season there was a transient yellowing of the foliage which may have been an expression of temporary phytotoxicity of the treatment.

The broadcast treatment of Vorlex-201 was superior at the 5 percent level in flower production to all other treatments except the broadcast treatment with Vorlex (Table 1). The FPI ratings were 431 and 384 for broadcast Vorlex-201 and Vorlex respectively. In-the-row single chisel application of Vorlex and Vorlex-201 were 374 and 294 respectively and significantly better than zinophos-Thimet or the check.

Economically the results were different with respect to crop gain because of 2 factors: namely, in-the-row applications required less material than broadcast applications and Vorlex is less expensive than Vorlex-201. The greatest dollar gain ($245 per acre) over no chemical treatment was with Vorlex applied in-the-row, followed by Vorlex-201 ($225 per acre) applied broadcast. The dollar gains by using Vorlex broadcast and Vorlex-201-in-the-row were relatively small ($85 and $67 per acre, respectively). The use of zinophos + Thimet resulted in no dollar gain.

LITERATURE CITED

1. Duncan, D. B. 1955. Multiple range and multiple F tests. Biometrics 11: 1-42.
2. Overman, A. J. 1961. Effective use of soil nematicides for gladiolus. Proc. Fla. State Hort. Soc. 74: 382-385.
3. Overman, A. J. 1965. Efficacy of broad-spectrum soil fumigants for control of rootknot nematodes in gladiolus. Proc. Fla. State Hort. Soc. 78: 445-449.

CONTROL OF ROOT MEALYBUG, Geococcus coffeae GREEN

L. C. KUITERT[1] AND G. W. DEKLE[2]

INTRODUCTION

The mealybug, *Geococcus coffeae* Green, was first recorded in Florida in 1958. H. M. Van Pelt, Plant Specialist, and H. A. Denmark, Chief Entomologist, Division of Plant Industry, found specimens on the roots of *Philodendron selloum* and *Dieffenbachia* sp. growing in a greenhouse in Apopka. Specimens were sent to the late Dr. H. Morrison, Coccidologist, United States Department of Agriculture, Insect Identification and Parasite Introduction Research Branch,

[1]Entomologist, Florida Agricultural Experiment Station, Gainesville.
[2]Entomologist, Division of Plant Industry, Gainesville.

TABLE 1.- Control of Mealybug with Treatments Used as Dips and Drenches.

Treatment*	Concentration per 100 gals.		Date 10-19-65		Date 10-27-65		Date 11-3&4-65		Date 11-10-65		Remarks
	Dip	Drench	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead	
Meta-Systox-R 25.4% E	1 qt.		Yes	Yes	0		0		0	Yes	
	1 pt.		Yes	Yes	0		0		0		
		1 qt.	0		Yes 2		Yes 2		0		Eggs failed to hatch in lab sample; frequently found collapsed.
		1 pt.	Yes		Yes 6		Yes 3		0		
Disyston 65.7% E	1 qt.		0		0	8	0		0	Yes	
	1 pt.		0		0	18			0	Yes	
		1 qt.			Yes 7		0		0	Yes	
		1 pt.							0	Yes	
Baygon 13.9% sp. C.	2 qts.						0		0	Yes	
	1 qt.								0	Yes	
		2 qts.							0	Yes	
		1 qt.							0	Yes	Considerable plant injury.
Dimethoate 267 E	2 qts.						0		0		
	1 qt.						0		0		
		2 qts.							0		High rate caused appreciable plant injury - leaf drop.
		1 qt.							0		
Phorate 47.5% E	1 qt.		0				0	14	0		
		1 qt.	0				7		0		
Malathion 50% E	1 qt.								0		
U.C. 21149 10% G.									Yes		May require longer interval.

* Treatments Applied 10/7/65

Washington, D. C., who identified them as *Geococcus coffeae* Green. Dr. Morrison also reported this mealybug to be a new continental record. Plans were formulated to undertake a special survey for this pest in greenhouses in the Apopka area. Additional infestations were reported from greenhouses in Altamonte Springs, Lockhart, Oviedo, and Zellwood. All infestations were treated with insecticides to disrupt any further spread and, eventually to eradicate the pest.

In September 1965, C. O. Youtsey, Supervisor, Citrus Budwood Section, Division of Plant Industry, found the mealybug infesting roots of container-grown citrus in a greenhouse in Winter Haven. The roots of Chinese box-orange growing near the greenhouse also were found infested with this mealybug, indicating that *G. coffeae* is capable of establishing itself on plants growing outdoors. Additional inspections showed some 15 percent of the plants growing in the greenhouse were infested. In most instances, no noticeable deterioration of the plant was observed.

A proposal was made to evaluate several insecticides for effectiveness in controlling this pest in conjunction with the eradication program.

Distribution

The insect was described by Green in 1933 from specimens collected in Dutch Guiana from roots of coffee tree, *Coffeae liberica.*

The insect has been reported from the following tropical and subtropical countries since that time:

1. Brazil
2. Ceylon
3. Colombia
4. Costa Rica
5. Cuba
6. Dominican Republic

7. Dutch Guiana
8. El Salvadore
9. Gold Coast
10. Guatemala
11. Honduras
12. India
13. Nigeria
14. Palau
15. Panama
16. Peru
17. Philippines
18. Uganda
19. United States (Florida, Hawaii, Puerto Rico)
20. Zanzibar

The general distribution of this root mealybug is shown in Fig. 1.

Description and Host Plants

The adult female is snow white, elongate-oval, 2 to 2.5 mm in length (Fig. 2-A, B). The anal lobes of the adult female are reddish-brown and have a prominent, chitinized, upturned anal hook at the tip of each lobe. A much smaller pair of downward curved median hooks appear to occur on the last abdominal segment (Fig. 3). These prominent hooks are used to separate *G. coffeae* from the other species of subterranean mealybugs in Florida. Infestations occur on the roots of various species of foliage plants and most varieties of citrus.

The host plants include: *Aglaonema, Caladium, Canna, Chamaedora, Citrus, Codiaeum, Coffeae, Cyperus, Desplatzia, Dichorisandra, Diffenbachia, Eugenia, Eupatorium, Gnaphalium, Hedera, Indigofera, Ipomoea, Musa, Nerium, Osmanthus, Paspalum, Peperomia, Philodendron, Pilea, Schefflera, Scindapsus, Serissa, Severinia, Solanum, Syngonium Theobroma, and Xanthosoma.*

Procedure

The test plants included sour orange, key lime and citron. These plants were growing in 46 ounce juice cans, and were used as indicator plants for the tristeza indexing program. Many of the cans were in poor condition, having rusted out to the soil level in many cases and in some cases even below the soil level. This factor was not important in treating plants to be dipped

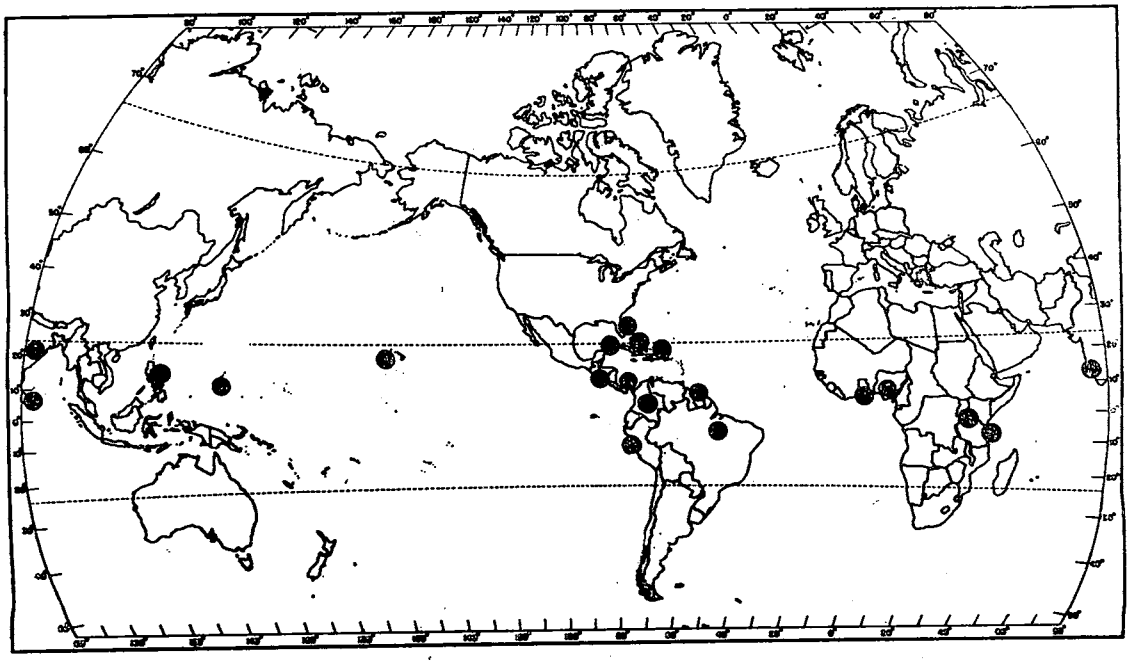

Fig. 1.—General distribution of G. coffeae.

Fig. 2-A.—Roots of Potted Plant infested with Mealybug, Geococcus coffeae Green.

but was significant when the treatment was applied as a drench as it was difficult to obtain good distribution of the chemical throughout the soil mass.

Infested plants were obtained by knocking the soil out of the container and examining the soil and root mass. Plants found infested were returned to the can and set aside. Each treatment was applied to 8 sour orange, 8 key lime, and 2 to 4 citron plants.

The dip treatment consisted of placing the test plants, still in containers, in the treatment so that the soil and root mass were submerged. Eight gallons of water were measured out into 20-gallon plastic containers. The insecticide was

Fig. 2-B.—Closeup Showing Individual Mealybugs.

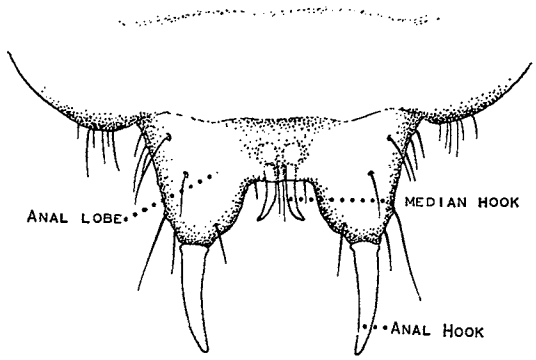

Fig. 3.—Anal lobes of adult female.

added and the solution stirred for approximately 1 minute. Plants were placed in the treatment for 15 minutes, removed, and the excess liquid allowed to drain off, after which the plants were labeled and placed on benches (Fig. 4).

The drench treatment consisted of adding 100 cc. of the spray mixture to the soil of each container. This was added slowly to allow for good distribution through the soil and root mass. Following treatment, the plants were labeled and placed on benches.

Fig. 4.—Method of holding treated plants for later examination.

The granular formulation was applied to the surface of the soil and the soil was stirred to incorporate the material into the top inch of soil. The treated plants were then watered lightly, labeled and placed on benches.

Treatment and Concentrations Used

The following treatments were evaluated for effectiveness and phytotoxicity.

1. Meta-Systox-R. 25.4% (2 lb. active/gallon) was used at rates of 1 pint and 1 quart per 100 gallons. Each concentration was used as a dip and drench.
2. Di Syston—65.7% liquid concentrate (6 lb. active/gallon) was used at concentrations of 1 pint and 1 quart per 100 gallons. Each concentration was used as a dip and a drench.
3. Baygon—13.9% spray concentrate (1.5 lb. active/gallon) was used at concentrations of 1 and 2 quarts per 100 gallons. Each concentration was used as a dip and a drench.
4. Dimethoate—267-E Concentrate (2 lb. active/gallon). This material was used at concentrations of 1 and 2 quarts per 100 gallons.
5. Phorate—47.5% E.C. containing 4 lb. active/gallon. This material was used as a dip and a drench at a concentration of 1 quart per 100 gallons.
6. Experimental insecticide U.C. 21149—10% granular. This was applied at the rate of 20 lbs. per acre.
7. Malathion—50% E.C. (4 lb. active/gallon) was used at the rate of 1 quart per 100 gallons. It was used as a dip.

Results and Discussion

Effectiveness of the treatment was determined by examing the root mass under a binocular microscope for mealybugs and eggs. The initial examination was made 12 days after treatment. Three additional examinations were made at approximately one week intervals with the exception of the Dimethoate and Baygon treatments which caused severe plant injury and the granular treatment. No living mealybugs or mealybug eggs were found in any of the treatments applied as a dip or drench after a period of five weeks. Live mealybugs were found on the roots of plants treated with the granular formulation. Results of the examinations are given in Table 1.

REFERENCES

Dekle, G. W. 1965. A Root Mealybug (**Geococcus coffeae** Green). Fla. Dept. Agri., Div. Pl. Ind. Ento. Circ. No. 43.
Green, E. E. 1933. New Coccidae from Dutch Guiana. Stylops 2:49-58.
Strickland, A. H. 1947. Coccids Attacking Cacao (**Theobroma cacao** L.) in West Africa, with Descriptions of Five New Species. Bull. Ent. Res. 38:497-523.
Williams, J. D. 1958. The Mealybugs (Pseudococcidae: Homoptera) Described by W. M. Muskell, R. Newstead, T.D.A. Cockerell and E. E. Green from the Ethiopian Region. Bull. British Mus. (Nat. Hist.) Ent. 6 (8):205-236.

EFFECT OF APPLICATION TIME OF SLOW RELEASE AND READILY AVAILABLE NITROGEN AND POTASSIUM SOURCES ON GROWTH AND CHEMICAL COMPOSITION OF RHODODENDRON INDICUM 'FORMOSA'

R. D. Dickey[1] and R. T. Poole[1]

Abstract

Experiment 1—A 3x2x2x2 factorial experiment was initiated April 5, 1965, to test effects of slow release urea-formaldehyde (UF), encapsulated ammonium sulfate (CN) and K frit (frit) applied at experiment's initiation or in split applications versus ammonium nitrate (AN) and KCl applied in solution monthly or bimonthly on growth, quality and chemical composition of *Rhododendron indicum* 'Formosa.'

Florida Agricultural Experiment Stations Journal Series No. 2574.
[1]University of Florida, Gainesville.