RESISTANCE AMONG LANTANA CULTIVARS TO THE LANTANA LACE BUG, TELEONEMIA SCRUPULOSA (HEMIPTERA: TINGIDAE)

Authors: Reinert, James A., George, S. W., Mackay, W. A., and Davis, T. D.

Source: Florida Entomologist, 89(4) : 449-454

Published By: Florida Entomological Society

URL: https://doi.org/10.1653/0015-4040(2006)89[449:RALCTT]2.0.CO;2

RESISTANCE AMONG LANTANA CULTIVARS TO THE LANTANA LACE BUG, *TELEONEMIA SCRUPULOSA* (HEMIPTERA: TINGIDAE)

JAMES A. REINERT, S. W. GEORGE, W. A. MACKAY AND T. D. DAVIS
Texas A&M University Res. & Ext. Center, 17360 Coit Rd, Dallas, TX 75252-6599
e-mail: j-reinert@tamu.edu

ABSTRACT

Lantana lace bug, *Teleonemia scrupulosa* Stål, (Hemiptera: Tingidae) is a primary insect pest of lantana, a landscape plant commonly grown across the southern United States. Twenty-eight cultivars of lantana were evaluated for resistance to lantana lace bug in replicated field plantings. Natural infestations of lantana lace bugs developed in mid-Jul, and were dispersed across all the replicates within 30 d in Dallas, TX. Populations of nymphs and adults were sampled bi-weekly from Sep-Nov 1996. Highest mean populations were present on 'Patriot Desert Sunset' (40.3 nymphs and adults/3-leaf sample/plant), 'Pink Frolic' (20.6) and 'Patriot Sunburst' (19.4). Nineteen of the cultivars exceeded 4 lace bugs per 3-leaf sample. Lace bugs were never detected on 3 cultivars, 'Weeping White', 'White Lightning' and 'Weeping Lavender' during the test period, and 'Imperial Purple', 'Patriot Rainbow' and 'Denholm Dwarf White' had seasonal means of only 0.1 total lace bugs per sample. Cultivars of *L. montevidensis* (K. Spreng.) Briq. (mean of 0.02 lace bugs/3 leaf sample) were highly resistant, whereas many cultivars of *L. camara* L. and *L. hybrida* hort (6.73 and 9.54 lace bugs/3 leaf sample, respectively) were susceptible. Cultivars with gold, red, purple, and white flowers had far fewer lace bugs than did cultivars with either orange/red, yellow, or bicolors of yellow with another color. These results indicate that within most flower colors or bicolors, there exists a range of resistance among the cultivars and usually at least 1 cultivar per color form with resistance to the lantana lace bug.

Key Words: *Lantana montevidensis*, *Lantana camara*, *Lantana hybrida*, host plant resistance, ornamental plants, herbaceous landscape plants

RESUMEN

El chinche de encaje de la lantana, *Teleonemia scrupulosa* Stål, (Hemiptera: Tingidae) es la plaga insectil principal de lantana, una planta de paisaje sembrada comúnmente por todo el sur de los Estados Unidos. Veinte ocho variedades de lantana fueron evaluadas para su resistencia al chinche de encaje de la lantana en replicaciones de siembras de campos. Infestaciones naturales del chinche de encaje de la lantana se desarrollaron a mediados de julio, y fueron dispersados por todas las repeticiones de ensayo dentro de 30 dias en Dallas, Texas. Las poblaciones de las ninfas y adultos fueron muestreadas cada dos semanas desde septiembre hasta el mes de noviembre de 1996. El promedio de las poblaciones mas altas se encontraron en el 'Patriot Desert Sunset' (40.3 ninfas y adultos/por muestra de 3 hojas por planta), el 'Pink Frolic' (20.6) y el 'Patriot Sunburst' (19.4). Diez y nueve de las variedades sobrepasaron los 4 chinches de encaje por muestra de 3 hojas. Los chinches de encaje no fueron detectados en las siguientes 3 variedades, 'Weeping White', 'White Lightning' y 'Weeping Lavender' durante el periodo de la prueba; por otro lado 'Imperial Purple', 'Patriot Rainbow' y 'Denholm Dwarf White' tenian un promedio estacional de solamente 0.1 chinche de encaje por muestra total. Las variedades de *L. montevidensis* (K. Spreng.) Briq. (promedio de 0.02 chinches de encaje/muestra de 3 hojas) fueron altamente resistentes, mientras muchas de las variedades de *L. camara* L. y *L. hybrida* hort (6.73 y 9.54 chinches de encaje/muestra de 3 hojas, respectivamente) fueron susceptibles. Las variedades con flores de color de oro, rojo, morado y blanco tenian mucho menos chinches de encaje que las variedades con flores de color anaranjado/rojo, amarillo, o los de dos colores de amarillo con otros colores. Estos resultados indican que entre la mayoria de un color de flor o de dos colores, existe un rango de resistencia entre variedades y usualmente por lo menos una variedad por color se forma con resistencia al chinche de encaje de la lantana.

Many cultivars of lantana (Verbenaceae) are used as annuals or as herbaceous perennials in containers and hanging baskets, or as a low hedge or as foundation shrubs in urban landscapes. Most cultivated species are native to tropical or subtropical North and South America, but some are native to warmer regions of the Old World. As a landscape plant, lantana is valued for its profuse show of color throughout a long season, often every month of the year in frost-free areas, its drought, heat and salt tolerance, aromatic foliage, and attractiveness to butterflies (Arnold 1999;

Everett 1981; Welch 1989). Two species are commonly used by the landscape industry. *Lantana camara* L. is a robust, more or less prickly shrub that is native to the southern United States and tropical America, whereas *L. montevidensis* (K. Spreng.) Briq. is a trailing or weeping lantana with slender pubescent stems up to 90 cm long or longer (Staff, L. H. Bailey Hortorium 1976; Everett 1981). *Lantana hybrida* hort cultivars is considered to be a hybrid between South American, Mexican, and West Indian species, but some are probably hybrids between the former two species (Everett 1981). *Lantana hybrida* hort cultivars exhibits characteristics of *L. camara* but is far more compact and seldom exceeds 30 cm in height.

Much of the literature on lantana centers on its introduction around the world as an ornamental and its unfortunate escape to become a noxious weed. It has been reported as a weed in 47 countries competing with 14 crops and infesting millions of hectares (Holm et al. 1977). Lantana lace bug, *Teleonemia scrupulosa* Stål (Hemiptera: Tingidae), has been introduced for biocontrol of lantana in over 20 countries, including Australia, India, many countries in Africa, Hawaii, and many island nations around the world (Harley and Kassulke 1971; Julien 1987). Most of the literature (other than taxonomic) on lantana lace bug relates to its introduction and use for biological control.

Across the southern United States, lantana lace bug is a late summer and fall annual pest of lantana cultivated in ornamental plantings. In Texas, as summer temperatures begin to rise and most plants begin to suffer from water stress, lantana plants thrive and flower profusely except where they are under attack by the lantana lace bug. The insect's behavior has been studied in Fiji (Simmonds 1929), India (Kahn 1946; Roonwall 1952) and Australia (Fyfe 1937). The nymphs develop on the underside of the leaves first causing a yellow spotting of the foliage, followed by silver to white bronzing with the leaves eventually browning and dropping from the plant. During nymphal feeding, large patches of black varnish-like droplets of excrement are deposited on the underside of the leaves and the molted skins of nymphs frequently remain attached. Adults are found on the leaves but also feed heavily on the flowers and cause a marked reduction in flowering and seed set (Wilson 1960). The objective of the present study was to evaluate 28 cultivars of lantana that are used in the nursery trade for their resistance or susceptibility to the lantana lace bug.

Materials and Methods

Lantana plants cultivated in 10 × 10 cm pots were planted ≈1 m apart in a series of raised field beds in a randomized complete block design with 6 replications of 1 plant per replicate. Only 3 replicates of several of the cultivars were evaluated (Table 1) due to a shortage of plant material. The highly alkaline (~8.0 pH), poorly aerated clay soil in the beds was amended by thoroughly incorporating a 5.1-cm-thick layer of sphagnum peat. Beds were mulched with a layer (7.5 cm thick) of cottonseed hulls and plants were irrigated thoroughly with soaker hoses every 7-10 d. A 21-7-14 (N-P-K) fertilizer, in which half of the N was formulated for slow-release, was incorporated into the soil mix prior to planting at a rate of 907.2 g / 9.3 m^2. A second application at the same rate of nutrients was applied as a side dressing to the plants in mid-Jul, ca. 8 wk later.

Most of the lantana cultivars were planted on either 15 or 16 May 1996. Due to unavailability of plant material on these dates, 'Patriot Dove Wing' and 'Patriot Honeylove' were not planted until 2 Aug 1996. Cultivars were chosen because of their popularity with growers across Texas and the southwestern United States. Only a few of these cultivars are listed by Howard (1969) in his checklist of lantana cultivars at the Harvard University Arboretum, but many of the cultivars evaluated are recommended for Texas and the Southwest (Brenzel 1997; Perry 1992; Sperry 1991).

Population counts for lantana lace bug were taken every 2 wk beginning 11-12 Sep through 11 Nov 1996, by examining each plant. All plants were examined during a 2-d observation period for each sample date. The overall plant was examined by gently lifting each of the terminal branches and recording the number of nymph and adult lace bugs on 3 leaves with the heaviest infestation. Visual evaluations for leaf bronzing, defoliation, overall loss of plant vigor, and the late summer and fall reduction in flowering were all good visual indicators of cultivars with high lace bug populations.

Data Analysis

Data were analyzed by analysis of variance procedures (ANOVA and GLM) in PC-SAS (SAS Institute 1990) to determine the differences in susceptibility among the cultivars at each observation period. Adult and nymph infestations were analyzed separately to show colonization levels. All count data were transformed as square root of $n + 0.001$ before analysis to stabilize variances. Untransformed means are reported. A Resistance Performance Index = the number of times a cultivar ranked in the top statistical grouping, was calculated for each cultivar as a measure of overall resistance (Engelke et al. 1994).

Results and Discussion

A naturally occurring infestation of lantana lace bugs invaded the replicated lantana planting in mid Jul 1996, and was first detected on plants of the cultivar 'Pink Frolic'. By mid Aug, popula-

TABLE 1. RESISTANCE AMONG LANTANA CULTIVARS TO THE LANTANA LACE BUG (6 REPLICATED FIELD PLOTS) SUMMER, 1996, DALLAS, TX.

		Mean number of nymphs and adults per 3 leaves per plant[2]											
		12 Sep		26 Sep		10 Oct		24 Oct		11 Nov		Mean Total / Plant[3]	Resistance Performance Index[4]
Cultivar	Species[1]	Nymph	Adult	Nymph	Adult	Nymph	Adult	Nymph	Adult	Nymph	Adult		
Weeping White	Lm	0 a [6,*]	0[ns]	0 a	0[ns]	0 a	0 a	0 a	0 a	0 a	0 a	0 a	10
White Lightning[5]	Lm	0 a	0	0 a	0	0 a	0 a	0 a	0 a	0 a	0 a	0 a	10
Weeping Lavender	Lm	0 a	0	0 a	0	0 a	0 a	0 a	0 a	0 a	0 a	0 a	10
Imperial Purple	Lm	0.2 ab	0.2	0 a	0	0 a	0 a	0 a	0 a	0 a	0 a	0.1 a	10
Patriot Rainbow[5]	Lc	0 a	0	0 a	0	0 a	0 a	0.7 a-c	0 a	0 a	0 a	0.1 a	10
Denholm Dwarf White	Lc	0 a	0	0 a	0.2	0.2 a	0 a	0.3 ab	0 a	0 a	0 a	0.1 a	10
Radiation	Lc	4.2 a-d	0.2	0.3 a	0.5	0.3 a	0 a	0.3 ab	0 a	0 a	0 a	1.2 ab	10
Dallas Red[5]	Lc	1.7 a-c	0	2.0 a-d	0.3	1.3 ab	1.0 bc	0.7 a-c	0 a	1.0 a-c	0 a	1.6 ab	9
Gold Mound	Lh	5.3 a-d	0.8	1.8 a-c	0	1.8 ab	0.2 ab	0.3 ab	0 a	0.7 ab	0 a	2.2 ab	10
New Gold	Lh	5.7 a-d	0.2	7.9 a-e	0.7	3.8 a-d	0.2 ab	1.0 a-d	0 a	0.7 ab	0 a	4.0 a-d	10
Lemon Swirl[5]	Lc	15.0 d-g	0	7.0 a-e	0.3	0 a	0 a	1.3 a-e	0 a	0 a	0 a	4.7 a-d	9
Patriot Honeylove[5]	Lc	9.3 a-f	0	1.7 ab	0.3	9.7 d-g	0.3 ab	2.3 b-f	0.7 c	0 a	0 a	4.9 a-d	7
Confetti[5]	Lc	6.7 a-e	0	10.0 b-f	0	7.3 c-f	0 a	3.7 c-f	0.3 a-c	0.7 ab	0 a	5.7 a-e	7
Samantha	Lc	10.2 b-f	0	6.0 a-e	0	6.3 b-e	0 a	4.2 c-f	0.2 ab	4.0 c	0 a	6.2 a-e	6
American Red Bush[5]	Lc	4.3 a-d	1.3	12.3 d-g	0	13.3 e-h	0 a	8.0 fg	0 a	0.3 ab	0 a	7.9 a-f	7
Patriot Fire Wagon[5]	Lc	7.0 a-e	0	13.0 d-g	0.3	11.7 e-h	0 a	7.0 fg	0.4 a-c	2.0 bc	0 a	8.3 b-f	6
Miss Huff[5]	Lc	14.0 d-g	2.0	10.0 b-f	0.3	8.0 c-f	0 a	7.0 fg	0 a	0 a	0 a	8.3 b-f	6
Pink Caprice	Lc	14.5 d-g	0.5	8.0 a-e	0.5	11.2 e-h	0.3 ab	4.5 d-f	0.2 ab	2.7 bc	0 a	8.5 b-f	6
Spreading Sunset	Lh	16.8 d-g	0.2	10.3 b-f	0.2	7.3 b-f	0.2 ab	6.5 fg	0 a	1.8 a-c	0 a	8.7 b-g	6
Patriot Dove Wing[5]	Lc	0 a	0	30.0 f-h	0	15.7 f-h	1.7 c	2.3 b-f	1.0 c	0 a	0 a	10.1 c-g	5
Lemon Drop	Lh	21.3 e-g	0.3	16.2 d-g	0.5	9.0 d-g	0.2 ab	2.8 c-f	0 a	1.5 a-c	0 a	10.4 c-g	6
Silver Mound	Lh	32.0 f-g	0.3	10.8 b-f	0.5	7.3 c-f	0 a	4.0 c-f	0 a	2.2 bc	0 a	11.4 c-g	5
Golden King	Lc	34.2 f-g	1.2	12.3 d-g	0.3	12.3 e-h	0.3 ab	5.2 e-g	0 a	1.8 a-c	0 a	13.5 c-g	6
LSG Red-Orange	Lc	37.7 g	0.2	18.2 d-g	0.8	14.7 e-h	0.2 ab	3.8 c-f	0 a	2.3 bc	0 a	15.6 f-i	5
Irene[5]	Lc	26.7 fg	0.3	36.7 f-h	0	12.3 e-h	0.7 bc	6.0 e-g	0 a	0.7 ab	0 a	16.7 g-i	5
Patriot Sunburst[5]	Lc	3.0 a-d	0	55.3 h	1.0	22.0 h	0.3 ab	11.3 g	0.6 c	3.3 cd	0 a	19.4 hi	5
Pink Frolic[5]	Lc	40.0 g	0.7	28.0 f-h	0.3	20.7 gh	1.0 bc	7.0 fg	2.3 d	2.7 cd	0.3 b	20.6 i	2
Patriot Desert Sunset[5]	Lc	0 a	0	81.7 i	0.3	74.3 i	8.0 d	24.0 h	2.3 d	9.7 d	1.0 c	40.3 j	3

[1]Lantana species in study: Lm = *Lantana montevidensis*; Lc = *L. camara;* Lh = *L. hybrida*.
[2]Mean no. of nymphs or adults per 3-leaf sample per plant for the observation day.
[3]Mean total / plant is the mean of the total of all nymphs and adults for the 5 observation periods.
[4]Resistance Performance Index is the number of times an entry occurred in the top statistical group (highest possible is 10 for 10).
[5]These cultivars were only evaluated in 3 reps, all others had 6 reps.
[6]Analysis was made on square root of $n + 0.001$ transformation of the data: Untransformed means presented.
*Means in a column not followed by the same letter are significantly different by Waller-Duncan k-ratio t-test ($k = 100$) ($P \leq 0.05$): ns = non significant.

tions were also causing damage to foliage of 'Golden King', 'Irene', 'Lemon Drop', 'LSG Red-Orange', 'Silver Mound', and 'Spreading Sunset'. By early Sep, damage was widespread across the planting and relatively consistent across the replicates of the more susceptible cultivars.

The mean total of lace bugs per plant (Table 1) represents the average number of lace bugs (nymph + adult) per 3-leaf sample over the 5 observation periods. Data for 12 Sep showed nymphal development on 21 of the 28 cultivars. Highest populations were present on Pink Frolic (40.0 nymphs/3-leaf sample/plant) and LSG Red-Orange (37.7) whereas no populations of either nymphs or adults were observed on 'Weeping White', 'White Lightning', 'Weeping Lavender', 'Patriot Rainbow', 'Denholm Dwarf White', Patriot Dove Wing, or 'Patriot Desert Sunset'. A significantly lower population of only 0.2 nymphs/3-leaf sample/plant was present on 'Imperial Purple'. By 26 Sep, overall populations had decreased but were still highest on the cultivars that had supported the high populations throughout the season. The highest nymphal populations of 81.7 and 55.3 nymphs/3-leaf sample/plant were present on Patriot Desert Sunset and 'Patriot Sunburst', respectively. Patriot Dove Wing and Patriot Desert Sunset no longer appeared to be resistant as they had during the evaluation 2 wk earlier. By 11 Nov, the populations of lace bugs had declined on most of the susceptible cultivars. A high and damaging level, however, had been present on most of these cultivars throughout the 8-wk evaluation period and many of the cultivars were severely damaged with bronzed leaves and a considerable loss of leaves, flowers, and plant thriftiness. Once a plant was damaged to the extent that bronzed leaves were evident, it remained disfigured throughout the remainder of the growing season.

Lace bugs were never detected on Weeping White, White Lightning, and Weeping Lavender during the test period. Imperial Purple, Patriot Rainbow, and Denholm Dwarf White had mean populations of 0.1 total lace bugs per sample and never exceeded ≤0.7 insects per sample. The Resistance Performance Index shows that in addition to the aforementioned cultivars, 'Radiation', 'Dallas Red', 'Gold Mound', 'New Gold', and 'Lemon Swirl' also ranked either 9 or 10 (out of 10) times in the top statistical groupings. However, 'Patriot Honeylove', 'Confetti', 'Samantha' and 'American Red Bush' were also in the top statistical group for mean total lace bugs per 3-leaf plant sample, but these cultivars sustained significant lace bug populations during Sep and early-Oct and only occurred in the top statistical ranking either 6 or 7 times.

When cultivars are grouped by species and analyzed, the species, *L. montevidensis* (4 cultivars with a mean of 0.02 lace bugs/3-leaf sample) is highly resistant, whereas several of the *L. camara* and *L. hybrida* cultivars were resistant but most of them were susceptible to the lantana lace bug (Table 2). Cultivars of *L. montevidensis* produce either white or purple flowers.

Cultivars were analyzed separately for flower color. A cultivar with two predominant flower colors was analyzed as bicolor for the 2 colors. Cultivars with purple or white flower color had far fewer lantana lace bugs (means of 0.03 and 1.73, respectively) developing on them than did cultivars with other flower colors (Table 3). For the 2 white-flowered *L. camara*, Denholm Dwarf White is resistant while Patriot Dove Wing is a highly susceptible cultivar. A cultivar with low infestations of lace bugs and in the top statistical ranking or resistant was identified for each flower colors except for 2 bicolors, white/yellow and red/yellow (Table 3). Overall, it appears that cultivars with either yellow or yellow bicolor flowers are among the most susceptible to the lantana lace bug. Flower color has been implicated as an indicator of resistance in other ornamental plants. In studies with *Canna* spp., cultivars with red-, orange-, and scarlet-flowers were more susceptible to canna leafroller, *Calpodes ethlius* Stoll than those with yellow- or rose-flowers (Reinert et al. 1983). Also, in studies with oleander, *Nerium oleander* L., susceptibility to oleander caterpillar, *Syntomeida epilais jucundissima* Dyar, was much higher on cultivars with certain flower colors than on those with other flower colors (J. A. Reinert et al. unpublished data). Resistance may not be determined by flower color, but there appears to be a relationship to color, although not independent. Additional work is needed to fully understand what the relationship is between flower color and resistance to lantana lace bug and other insects.

TABLE 2. IMPACT OF SPECIES OF LANTANA ON THE INFESTATION LEVEL OF LANTANA LACE BUG.

Lantana spp.	No.[1]	Range of means for cultivars	Mean total nymphs + adults/3 leaves/plant[2]
L. montevidensis	4	0.0-0.1	0.02 a*
L. camara	19	0.1-40.3	6.73 b
L. hybrida	6	2.2-11.4	9.54 b

[1]No. of cultivars evaluated for each species.
[2]Mean total/plant are the mean of all nymphs and adults per 3 leaves per plant for 5 observation periods.
*Means in column not followed by the same letter are significantly different by Waller- Duncan k-ratio t-test ($k = 100$) ($P \leq 0.05$).

TABLE 3. IMPACT OF THE FLOWER COLOR OF LANTANA CULTIVARS ON THE POPULATION LEVELS OF LANTANA LACE BUG.

			Lace bugs per observation period[3]		Mean total lace bugs/3 leaves/5 obs. periods on each flower color[4]
Flower color (no.)[1]	Cultivars	spp[2]	Highest count	Mean[5]	
Purple (2)[6]					0.03 a
	Weeping Lavender	Lm	0	0 a*	
	Imperial Purple	Lm	0.4	0.1 a	
White (4)					1.73 ab
	Weeping White	Lm	0	0 a	
	White Lightning	Lm	0	0 a	
	Denholm Dwarf White	Lc	0.3	0.1 a	
	Patriot Dove Wing	Lc	30.0	10.1 c-g	
Gold (2)					3.10 bc
	Gold Mound	Lh	6.1	2.2 ab	
	New Gold	Lh	8.6	4.0 a-d	
Red (2)					4.75 bc
	Dallas Red	Lc	2.3	1.6 ab	
	American Red Bush	Lc	13.3	7.9 a-f	
Orange/Red (3)					8.47 cd
	Radiation	Lc	4.4	1.1 ab	
	Spreading Sunset	Lh	17.0	8.7 b-g	
	LSG Red-Orange	Lc	37.9	15.6 f-i	
Pink/Yellow (6)					9.27 d
	Patriot Rainbow	Lc	0.7	0.1 a	
	Patriot Honeylove	Lc	10.0	4.9 a-d	
	Confetti	Lc	10.0	5.7 a-e	
	Pink Caprice	Lc	15.0	8.5 b-f	
	Irene	Lc	36.7	16.7 g-i	
	Pink Frolic	Lc	40.7	20.6 i	
Yellow (6)					10.28 d
	Lemon Swirl	Lc	15.0	4.7 a-d	
	Samantha	Lc	10.2	6.2 a-e	
	Miss Huff	Lc	16.0	8.3 b-f	
	Lemon Drop	Lh	21.6	10.4 c-g	
	Golden King	Lc	35.4	13.5 c-g	
	Patriot Sunburst	Lc	56.3	19.4 hi	
White/Yellow (1)					11.43 d
	Silver Mound	Lh	32.3	11.4 c-g	
Red/Yellow (2)					24.30 e
	Patriot Fire Wagon	Lc	13.3	8.3 b-f	
	Patriot Desert Sunset	Lc	82.0	40.3 j	

[1]Cultivars with two predominant flower colors were analyzed as bicolor for the 2 colors.
[2]Lantana species in study: Lm = *Lantana montevidensis*; Lc = *L. camara;* Lh = *L. hybrida*.
[3]Plants sampled by counting total nymphs and adults per 3 leaves per plant for each of 5 observation periods; highest count per any sample period and mean total count during the test period.
[4]Mean total/plant = mean of the total of all nymphs and adults combined for the 5 observation periods.
[5]Data taken from Table 1.
[6]Number of cultivars with the flower color.
*Means in a column not followed by the same letter are significantly different by Waller-Duncan k-ratio t-test (k =1 00) ($P \leq 0.05$).

CONCLUSIONS

This information on the range of susceptibility among cultivars within each of the flower color groupings should be of considerable value to commercial growers, retail nurserymen, landscapers, and consumers. The species, *L. montevidensis*, provides resistant purple- (Weeping Lavender and Imperial Purple) or white-flowered (Weeping White and White Lightning) cultivars. Additionally, Denholm Dwarf White is a resistant white-flowered *L. camara* cultivar with a more upright, mounding growth habit. When lantana lace bug was being evaluated as a biocontrol agent in Aus-

tralia, Haseler (1966) observed that it defoliated white-flowered lantana (no species or cultivars given) and caused the plants to die. Our data show both resistance and susceptibility among the white-flowered cultivars. For the other flower color or bicolor groupings, there is a range of susceptibility among cultivars as well, typically with at least 1 cultivar ranking in the top statistical grouping and expressing resistance. For example, in the pink/yellow-flowered group, Patriot Rainbow is resistant, whereas all the other cultivars are susceptible with Irene and Pink Frolic being extremely susceptible. Harley & Kassulke (1971) and Radunz (1971) reported that lantana lace bug showed a preference for red-flowered lantana species, pink-flowered were least preferred, and white and orange showing intermediate damage, but they did not identify cultivars or species. Their statement, and the results presented here, emphasize the need to understand the potential genetic resistance of each cultivar regardless of the flower color. This range of susceptibility among the cultivars within each color grouping should allow the consumer to install landscape plantings of lantana that have an array of flower color but still provide a high level of natural (genetic) protection against this destructive pest.

Acknowledgments

Appreciation is extended to Erin Smith for technical assistance.

References Cited

ARNOLD, M. A. 1999. Landscape Plants for Texas and Environs. Stipes Publ. L.L.C. 596 p.

BRENZEL, K. N. (Ed.). 1997. Sunset National Garden Book. Sunset Books Inc., Menlo Park, CA.

ENGELKE, M. C., V. G. LEHMAN, AND S. J. MORTON. 1994. A turf performance index to classify varietal performance in regional and national trials. Agron. Abstr. 1994: 183.

EVERETT, T. H. 1981. The New York Botanical Garden Illustrated Encyclopedia of Horticulture. Garland Publ., Inc., New York Vol. 6.

FYFE, R. V. 1937. The lantana bug, *Teleonemia lantanae* Distant. J. Council Sci. and Indian Res. 10(3): 181-186.

HARLEY, K. L. S., AND R. C. KASSULKE. 1971. Tingidae for biological control of *Lantana camara* (Verbenaceae). Entomophaga 16(4): 389-410.

HOLM, L. G., D. L. PUCKNETT, J. V. PANCHO, AND J. P. HERBERGER. 1977. The World's Worst Weeds. HI Univ. Press, Honolulu 609 p.

HOWARD, R. A. 1969. A check list of cultivar names used in the genus *Lantana*. Arnoldia 29(11): 73-109.

JULIEN, M. H. 1987. Biological Control of Weeds, a World Catalogue of Agents and their Target Weeds. 2nd ed. Unwin Brothers Ltd., The Gresham Press, Old Woking, Surrey, Great Britain 144 p.

KAHN, A. H. 1946. On the lantana bug (*Teleonemia scrupulosa* Stål.). Indian J. Entomol. 6 (1-2): 149-161.

PERRY, B. 1992. Landscape Plants for Western Regions, An Illustrated Guide to Plants for Water Conservation. Dai Nippon Printing Co., Ltd., Hong Kong.

RADUNZ, L. A. J. 1971. Some Aspects of the Preferential Behavior of *Teleonemia scrupulosa* Stål, Towards its Host Plant *Lantana camara*. Honours Thesis, University of Queensland, Australia.

REINERT, J. A., T. K BROSCHAT, AND H. M. DONSELMAN. 1983. Resistance of *Canna* spp. to the skipper butterfly, *Calpodes ethlius* (Lepidoptera: Hesperiidae). Environ. Entomol. 12(6): 1829-1832.

ROONWALL, M. L. 1952. The natural establishment of an imported insect in India. The lantana bug, *Teleonemia scrupulosa* Stål (= *lantanae* Distant: Hemiptera, Tingidae) with a description of its eggs, nymphs, and adult. J. Zool. Soc. India 4(1): 1-16.

SAS INSTITUTE. 1990. SAS/STAT User's Guide, version 6.10 ed. SAS Institute, Cary, NC.

SIMMONDS, H. W. 1929. The life history of *Teleonemia lantanae*. Agr. J. Dep. Agric., Fiji Islands 2(1): 36-39.

SPERRY, N. 1991. Neil Sperry's Complete Guide to Texas Gardening. Taylor Publ. Co., Dallas, TX 388 p.

STAFF OF THE LIBERTY HYDE BAILEY HORTORIUM. 1976. Hortus Third. Macmillan Publ. Co., Inc., New York 1290 p.

WELCH, W. C. 1989. Perennial Garden Color for Texas and the South. Taylor Publ. Co., Dallas, TX 268 p.

WILSON, F. 1960. A Review of the Biological Control of Insects and Weeds in Australia and Australian New Guinea. Commonwealth Agric. Bur., Farnham Royal, Bucks, England. Technical Communication No. 1: 91 p.