Effects of Different Levels of Four Herbicides Used as Preemergent Treatment on the Establishment of Centipede Lawn Grass (*Erimochloa ophiuroides*)

S. J. Rodríguez and Angel R. Feliberty[1]

INTRODUCTION

Centipedegrass (*Erimochloa ophiuroides*) seems to be a well-adapted lawn grass for Puerto Rican conditions. It is generally propagated through divisions of the bunches and stolons, but the ground surface requires constant weeding by hand or hoe until the stolons cover up the ground and can compete with weeds. Since housing construction is a major industry in Puerto Rico, and lawn establishment is the main part of the landscaping, and very costly, it was of interest to see how certain herbicides used as preemergent treatments would control the developing weeds and, at the same time, how they would affect the growth of the grass. This article summarizes the results of a trial carried on at the Gurabo Substation in which four commercial herbicides affected weed population, as well as the development of the lawn.

MATERIALS AND METHODS

The following herbicides were used as preemergent treatment in the trial: Simazine [2-chloro-4,6-bis(ethylamino)-s-triazine], atrazine (2-chloro-4 ethylamino-6-isopropylamino-s-triazine), diuron [3-(3,4 dichloroplenyl)-1-1-dimethylurea], monuron [3-(p-chlorophenyl)-1-1-dimethylurea].[2] Commercial formulations in the form of wettable powder containing 80 percent of the active ingredients were used in the test. The rates of application of the first two herbicides were 2, 4, 8, 16 and 32 pounds per acre, while the last two were applied at 1, 2, 4, 8 and 16 pounds per acre, on the assumption that they would be effective at lower rates than the previous two.

A tract of Mabí clay land was prepared by plowing and racking for the propagation of centipedegrass. The usual method for the preparation of the soil consists in plowing at a depth of 6 to 10 inches. After about 2 weeks the soil was racked to leave the area as smooth as possible. The Mabí

[1] Associate Horticulturist and former Research Assistant in Agronomy, Gurabo Substation, University of Puerto Rico, Río Piedras, P.R.

[2] The first two herbicides were products of the Geigy Agricultural Chemicals Ardsley, N.Y. The other two, supplied as Karmex and Telvar, were products of the E. I. Dupont de Nemours and Co. (Inc.), Wilmington, Del. Trade names are used in this publication solely to provide specific information. Mention of a trade name does not constitute a guarantee, warranty, or endorsement by the Agricultural Experiment Station as superior to these or other similar products not mentioned.

soil is a heavily impervious soil from a colluvial origin present in terraces of the East Central part of the Island.

The propagation was done by planting divisions from bunches and stolons in holes at about 8 inches apart. In the area, 25 square-foot plots were separate for the herbicides treatments. A 2-foot border was left among treated plots.

The herbicides mentioned above were applied with a knapsack sprayer by suspending the required quantity of each for each plot in enough water to cover the area. The suspended herbicide was applied as uniformly as possible to the whole plot. The treatments were randomly distributed in each replication where four replications for the experiment were provided.

The emerging weeds were harvested after a month from herbicide application. No separation as to weed species was carried out. A count on the dead-grass bunches was carried on at the same time. The effect on growth was measured by harvesting the developing stolons after 2 months from treatments. Green weight in both cases was obtained by weighing in a Mettler automatic balance in the laboratory.

The data were analyzed through analysis of variance and regression analysis.

RESULTS AND DISCUSSION

The effects of the four herbicides on weed control and growth of centipedegrass are presented in table 1, and figures 1 and 2. Though the analysis of variance showed differences among individual treatments, the overall effect of the rates of the different herbicides used were not clearly established from the results. A regression curve was fitted to the results to determine the overall effect on weed control and growth (figs. 1 and 2). Since no provision was made to separate the weeds as to species, regression analysis showed that none of the four herbicides at the different rates prevented the development of weeds in the plots. The main reason for this was that the predominant weed was nutgrass (*Cyperus rotundus*), which appears to be resistant to the herbicides used even at the high rates used.

In most cases, the leaves of this weed showed some yellowing, but later on the weed reemerged from the underground stem. Since the experiment was carried on in a heavy clay soil there apparently was very little downward movement of the herbicides. There is evidence of this in that the downward movement was slower in heavier than in lighter textured soils (*2,6,7,8,10,11*).[3]

There is also the possibility that the herbicides used were absorbed through the leaves, no translocation occurring in the underground part that is generally a food reserve for the development of nutgrass.

[3] Italic numbers in parentheses refer to Literature Cited, p. 246.

We are dealing with herbicides the mode of action of which is by inhibiting photosynthesis (*1,3*). There is evidence of lack of downward translocation of certain herbicides (*5,9*); moreover, Gentner and Hilton (*4*) found that, when barley leaves were furnished with outside sucrose through the leaf-tips, they were able to withstand lethal doses of phenylurea herbicides. In our case the underground stem served as a ready source of food for further germination and growth.

TABLE 1.—*Effects of preemergent treatment of 4 herbicides on weed control and growth of centipede lawn grass*

Herbicide	Rate of application	Weed growth in green weight per plot[1]	Stolon growth in green weight per plot[1]
	Pounds/acre	*Grams*	*Grams*
Simazine	2	143.50	498.50
Do.	4	178.50	340.00
Do.	8	187.75	260.25
Do.	16	205.50	272.00
Do.	32	35.50	101.50
Atrazine	2	127.50	410.00
Do.	4	116.50	394.75
Do.	8	74.75	287.75
Do.	16	97.50	228.00
Do.	32	54.75	75.00
Monuron	1	256.00	453.00
Do.	2	405.25	421.25
Do.	4	82.50	414.00
Do.	8	90.00	314.00
Do.	16	61.25	105.00
Diuron	1	186.50	529.25
Do.	2	101.25	527.75
Do.	4	268.25	392.00
Do.	8	103.00	346.00
Do.	16	53.75	253.25
Check	0	528.00	536.25

[1] Mean values are averages for 4 replications.

The effects of the different concentrations of the four herbicides on the growth of centipedegrass are presented in table 1, but can be more clearly seen in figure 2. As expected, the higher the concentration the greater was the restriction in growth. Many of the original stolons were killed by the herbicides, especially at concentrations above 8 pounds per acre. In all cases the restriction on growth was significant or highly significant. Apparently in the urea-substituted herbicide the restriction is less at the lower rates, while in the two triazine herbicides the drop is steadier.

For practical purposes none of these herbicides should be used at rates

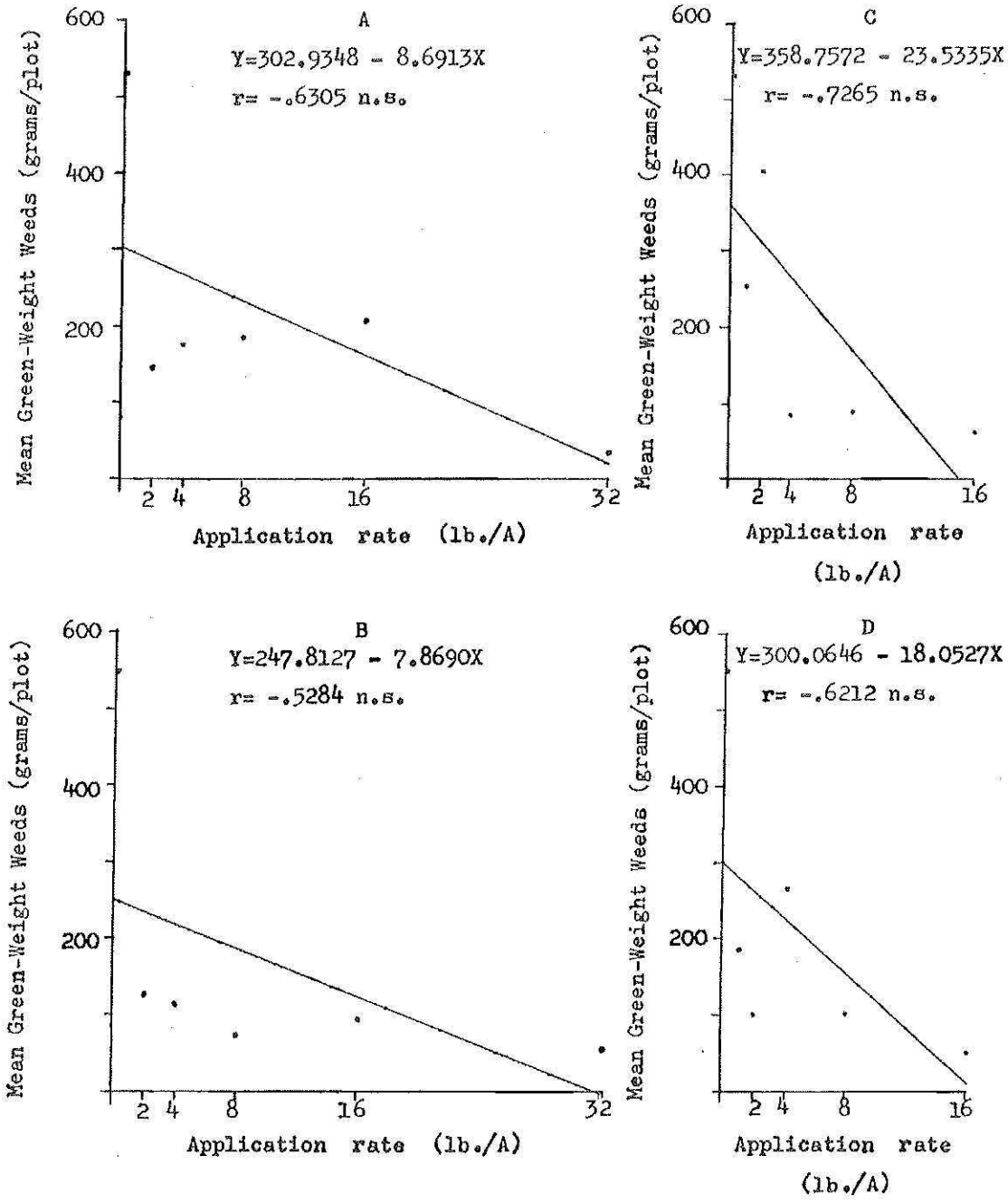

FIG. 1.—Regression curves of the effect of different levels of herbicides on weed growth in centipedegrass: A, Simazine; B, atrazine; C, monuron; D, diuron.

above 4 pounds per acre because of the restriction in growth, since the homeowners are interested in having a cover as soon as possible. The rate of application should be lower for the two phenylurea herbicides than for the two triazine herbicides.

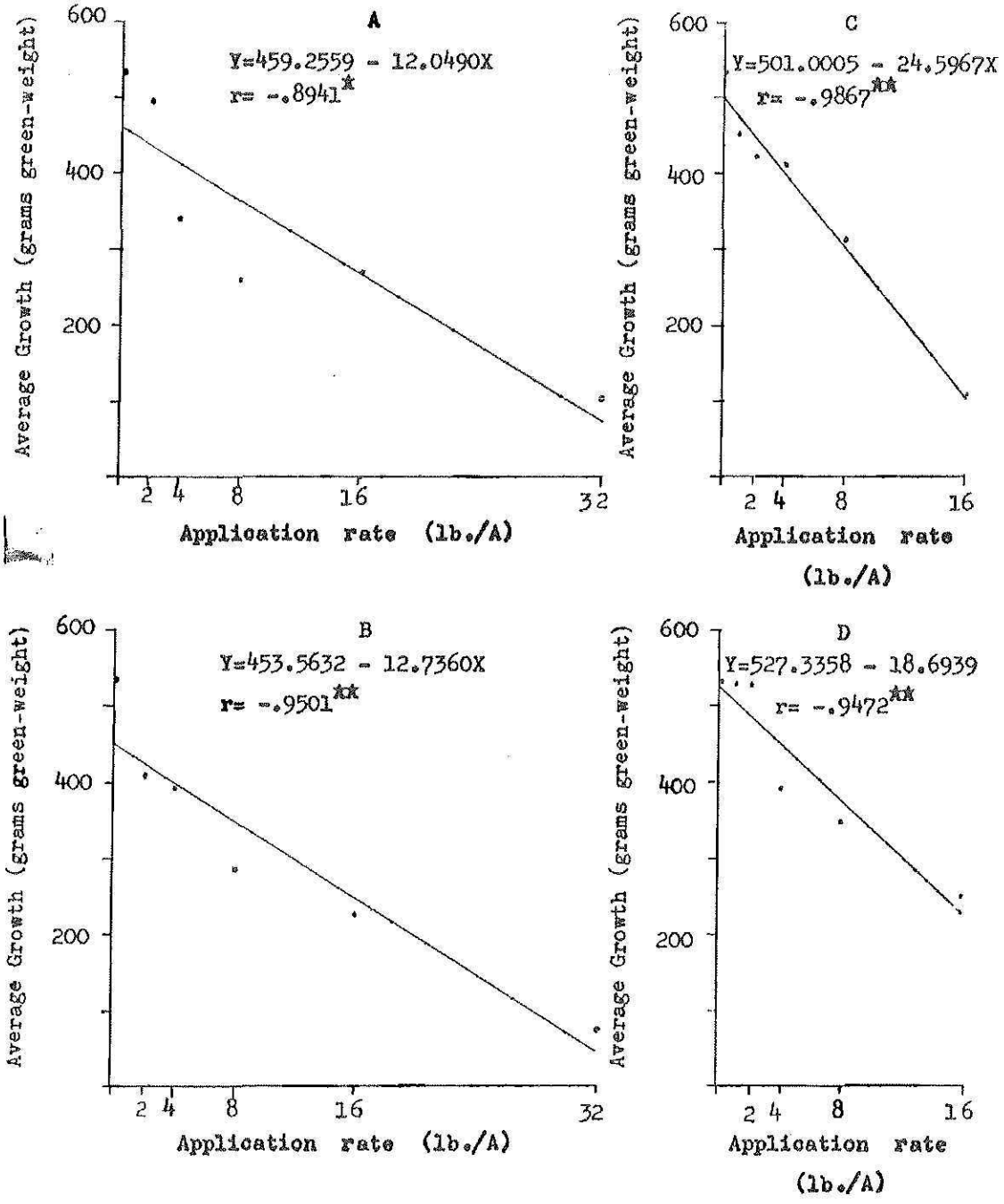

FIG. 2.—Regression curves of the effect of different levels of herbicides on growth of centipedegrass: A, Simazine; B, atrazine; C, monuron; D, diuron.

SUMMARY

Four herbicides: Monuron [3-(p-chlorophenyl)-1-1-dimethylurea], diuron [3-(3,4 dichlorophenyl)-1-1-dimethylurea], atrazine (2-chloro-4-ethyl-amino-6-isopropylamino-s-triazine), and simazine [2 chloro-4,6-bis (ethyl-

amino)-s-triazine] were tested at five levels as preemergent treatments in the establishment of centipede lawn grass. None of the four provided good control of weeds, since the predominating weed was nutgrass which seems resistant to the herbicides used. All four restricted the stolon development and spread of the grass studied, especially when the rates were over 2 pounds and 4 pounds per acre for the phenylureas and triazines herbicides, respectively.

RESUMEN

Se probó la acción preemergente de cuatro yerbicidas: Monuron [3-(p-clorofenil)-1-1-dimetilurea], diuron [3-(3,4 diclorofenil)-1-1-dimetilurea), simazine [2-cloro-4,6 bis (etilamino)-s-triazine] y atrazine (2-cloro-4- etilamino-6-isopropilamino-s-triazine), al establecerse un césped de grama de la variedad Ciempiés. Ninguno de los yerbicidas dio resultado satisfactorio, debido al predominio del Coquí, yerbajo que aparentemente posee una alta resistencia a los yerbicidas que se usaron. Los cuatro yerbicidas afectaron desfavorablemente el crecimiento de la yerba Ciempiés, registrándose los peores resultados a este respecto cuando se usaron sobre 2 libras y 4 libras de las ureas y las triazinas sustitutivas, respectivamente.

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