

Effect of the Hot-Water Treatment for the Control of Ratoon Stunting on the Germination of Some Commercial Sugarcane Varieties

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INTRODUCTION

The disease known as ratoon stunting was first recognized in Queensland, Australia, during the 1944–45 crop, and was formally reported from Australia by Mungomery (1).² Its presence in Puerto Rico was discovered a few years ago, but there exists the possibility that it may have been in the Island for a much longer time. Some of the varieties grown in Puerto Rico have been found definitely affected with the disease while, in others, symptoms of stunting have also been observed which may be attributed to the presence of the virus. The disease is caused by a highly infectious virus that can be easily transmitted by the cutter's knife and other cultivation implements after these come in contact with the infectious juice. Seed pieces of infected stalks of cane give rise to diseased plants which, in turn, become sources of infection. There is no insect vector known, although the rat has been suspected as capable of transmitting the virus under experimental conditions.

Certain investigators (2, 3) have clearly demonstrated that the ratoon-stunting disease can be effectively controlled by heat therapy using either hot air, as is practised, for example, in Louisiana, or hot water, as used in most areas. Differences in the tolerance of sugarcane varieties to heat treatment have been observed in other countries. It was consequently considered to be of considerable practical value to determine the heat tolerance of leading sugarcane varieties grown in Puerto Rico and, what is equally important, the particular section of the stem in these varieties least liable to be affected in their germination by the heat treatment.

MATERIALS AND METHODS

The equipment used for heat-treating the cuttings has already been described (4). Healthy cane stalks of varieties P.R.980, B.37161, P.O.J.2878, M.336, B.41227, H.328560, B.4362, B.40105, B.37172, and P.R.905 were divided into three sections: Top, middle, and bottom. Three-eyed seed pieces from each section were divided into two lots, one of which was

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² Italic numbers in parentheses refer to Literature Cited, p. 86.

treated at 50° C., using hot water for 2 hours, while the other was left untreated. Both lots were dipped in a solution of phenyl mercury acetate (PMA) after treatment and before planting.

The field experiment was a split-plot design with the varieties as the whole units and the treatments as subunits. The number of varieties was 10 and the number of treatments 6. Varieties and treatments were each replicated 5 times. The plots were 6 feet long by 4 feet wide and 10 seed pieces were planted in each plot.

The experiment was carried on at Solís Farm, Río Piedras Main Station,

TABLE 1.—Percentage germination of 10 sugarcane varieties heat-treated with hot water at 50° C. for 2 hours for the control of the ratoon-stunting disease at Solís Farm, May 1957

Variety	Percentage germination under treatment indicated ¹					
	CB	WB	CM	WM	CT	WT
P.R. 980	84.6	81.3	98.0	94.6	95.6	68.0
B. 37161	95.3	79.3	96.0	81.3	96.6	52.0
P.O.J. 2878	63.3	45.3	86.0	64.6	96.6	32.6
M. 336	81.3	70.0	88.6	66.6	94.0	38.0
B. 41227	54.0	14.6	80.6	32.6	91.3	5.3
H. 328560	88.0	63.3	92.6	74.0	98.6	32.6
B. 4362	87.3	70.6	94.0	77.3	98.3	2.6
B. 40105	86.6	12.0	85.3	32.6	86.6	2.6
B. 37172	89.3	60.0	94.0	58.0	98.3	24.2
P.R. 905	67.3	55.3	88.2	65.3	96.0	19.3

¹ CB = control unheated, base of cane; WB = heat-treated, base of cane; CM = control unheated, middle of cane; WM = heat-treated, middle of cane; CT = control unheated, top of cane; WT = heat-treated, top of cane.

and the germination counts were made 2 months after the canes were planted.

RESULTS AND DISCUSSION

The results of the experiment are summarized in tables 1 and 2.

As can easily be seen the heat treatment significantly reduced the germination of the top section in all the varieties. The least affected by treating the top were P.R.980 (68 percent germinated), and B.37161 (52 percent). The worst-affected by heat-treating the top were B.4362 (2.6 percent), B.40105 (2.6 percent), and B.41227 (5.3 percent).

For the middle section the treatment significantly reduced the germination of the cane in all the varieties tested, with the exception of P.R.980. In this case the highest percentages of germination were obtained in P.R.980

(94.6), B.37161 (81.3), and B.4362 (77.3); the lowest in B.41227 and B.40105 (32.6 percent each).

In the basal-section group the treatment significantly affected the germination of seven varieties. P.R.980, M.336, and P.R.905 were not affected. The highest percentage of germination was obtained for P.R.980 (81.3).

In comparing the effect of the heat treatment on the different stem sections in each variety the following results were obtained: In all cases the germination of the middle section was significantly superior to that of the top section, and in seven varieties the basal section was significantly

TABLE 2.—Average number of germinated eyes of the seed pieces of 10 varieties of sugarcane when treated with hot water at 50° C. for 2 hours

Variety	Eyes germinated under treatment indicated ¹					
	CB	WB	CM	WM	CT	WT
P.R. 980	25.4	24.4	29.4	28.4	28.4	20.4
B. 37161	28.6	23.8	28.8	24.4	29.0	15.6
P.O.J. 2878	19.8	13.6	25.8	19.4	29.0	9.8
M. 336	24.4	21.0	26.6	20.0	28.2	11.4
B. 41227	16.2	4.4	24.2	9.8	27.4	1.6
H. 328560	26.4	19.0	27.8	22.2	29.6	11.4
B. 4362	26.2	21.2	28.2	23.2	29.2	.8
B. 40105	26.0	3.6	25.6	9.8	26.0	.8
B. 37172	26.8	18.0	28.2	17.4	29.2	7.2
P.R. 905	20.2	16.6	26.2	19.6	28.8	5.8

L.S.D. at 1-percent level = 5.1

L.S.D. at 5-percent level = 3.9

¹ CB = control unheated, base of cane; WB = heat-treated, base of cane; CM = control unheated, middle of cane; WM = heat-treated, middle of cane; CT = control unheated, top of cane; WT = heat-treated, top of cane.

superior to the top. There was no significant difference in the germination of the treated basal and middle sections in six varieties, and in the remaining four the difference in germination was in favor of the middle section.

In all cases the percentage of germination were greater for the base than for the top and, with the exception of B.37172 and M.336, the percentage of germination were greater for the middle than for the base section.

SUMMARY

An experiment was conducted using the hot-water treatment at 50° C. for 2 hours for the purpose of determining the tolerance of some commercial sugarcane varieties grown in Puerto Rico to the heat treatment used in the control of the ratoon-stunting disease, as well as the effect on the germina-

tion of the different sections of the stem. Three-eyed seed pieces from the top, middle, and bottom sections of the following the canes were used: P.R.980, B.37161, P.O.J.2878, M.336, B.41227, H.328560, B.4362, B.40105, B.37172, and P.R.905. The results were as follows:

1. There were marked differences among the varieties tested in regard to heat tolerance, as reflected by the percentage germination of the heat-treated canes.

2. In general, the middle section tolerated the heat treatment better than the top, whereas the basal section was also more resistant to heat than the top.

RESUMEN

Se llevó a cabo un experimento con el propósito de determinar el efecto del tratamiento con agua caliente sobre la germinación de algunas variedades de caña de azúcar y además la tolerancia al calor de las distintas partes del tallo (base, medio y punta) de las distintas variedades.

Los resultados fueron los siguientes:

1. Hubo diferencias notables en cuanto a la germinación de las distintas variedades tratadas con calor.

2. Referente al tratamiento con calor de las distintas secciones del tallo se puede decir que, en general y con excepción de las variedades B.37172 y M.336, la parte del medio se afectó menos con el tratamiento que la base y asimismo la base menos que la punta.

LITERATURE CITED

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