Failure to Transmit the Causal Agent of Ratoon-Stunting Disease of Sugarcane Through the Soil

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INTRODUCTION

Ratoon stunting is one of the various diseases of sugarcane caused by a virus. It was recognized as a distinct disease in Queensland during the 1944–45 season. Since 1950 (*1*)[2] the disease has been reported as gaining in importance in most of the sugarcane-growing countries of the world, including Puerto Rico, where it has been intensively studied for the past few years.

The ratoon-stunting disease is readily transmitted by the cane knife or other instruments of harvesting. Several other efficient methods of introducing the virus into the uninfected cuttings have been described (*2*). The chief source of propagation of the disease is, however, through the seed pieces from infected stalks. Mungomery (*3*) further reported that sugarcane plants were easily infected when roots were cut with a knife smeared with infective juice, and that the virus occurred in maximum concentration in mature leaves, leaf sheaths, and stems, and less so in roots and immature tissues.

The extent of the natural spread of ratoon stunting is as yet unknown, but evidence is accumulating that the disease does not spread rapidly without the agency of man. Hughes and Steindl (*4*) reported observations on experimental plantings involving a wide range of varieties which have remained disease-free, although growing in rows adjoining diseased cane for the full plant and first ratoons.

In view of the fact that Bird *et al.* (*5*, *6*) working at this Station, have recently found experimentally that the causal agent of the chlorotic streak disease of sugarcane is transmitted when roots of healthy cane plants are in direct contact with roots of diseased plants, we considered it of interest to determine in the greenhouse the possibility of transmitting the ratoon-stunting virus from infected to healthy plants through the soil.

PROCEDURE

Twelve-inch pots filled with a mixture of sandy loam and filter-press cake were steam-sterilized and planted with one-eyed cuttings in the following manner:

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[2] Italic numbers in parentheses refer to Literature Cited, p. 90.

Treatment 1, 20 pots with 2 cuttings planted side by side, but separated by a wooden label (fig. 1). Half of the cuttings were taken from ratoon-stunted plants previously examined for and showing the internal symptom of ratoon stunting. The other half was obtained from canes apparently healthy on examination and treated with heat at 50° C. for 3 hours.

Treatment 2, 16 pots planted in the same manner but with healthy heat-

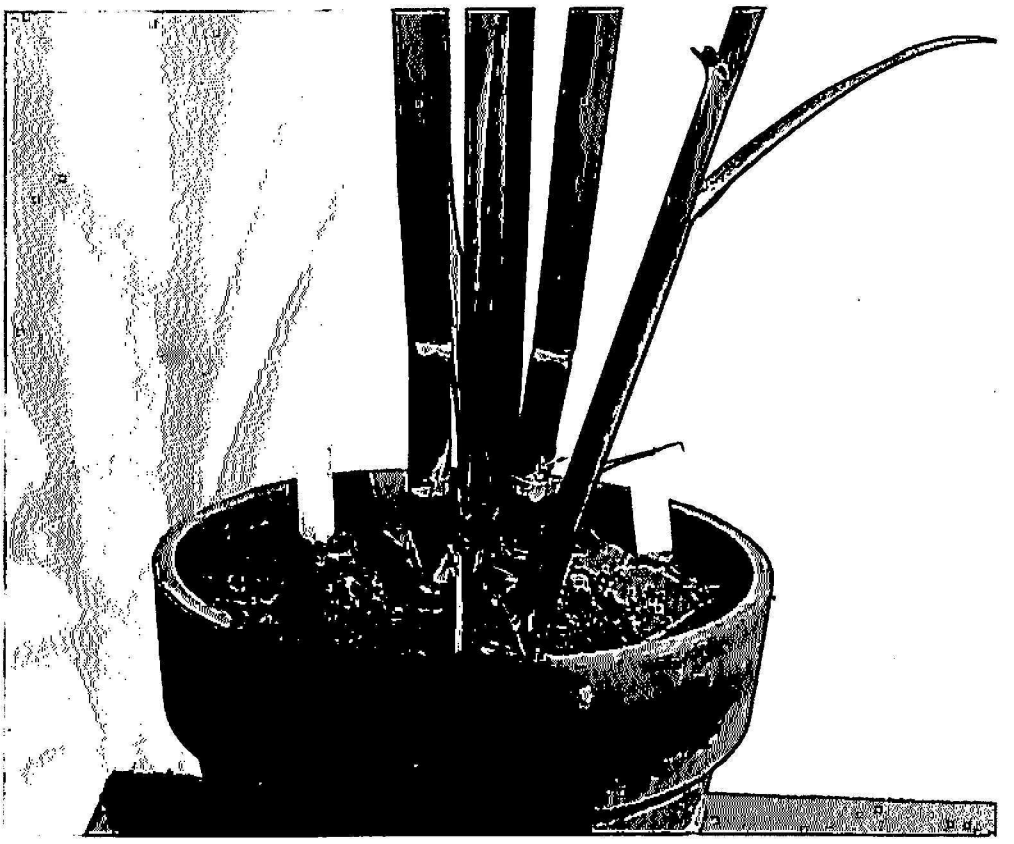

FIG. 1.—Pot showing wooden label separating healthy cutting at left from infected cutting at right.

treated cane cuttings, half of which were inoculated with ratoon-stunting virus and the other half left uninoculated.

Treatment 3, 8 pots, 4 of which were planted individually with 1 ratoon-stunting virus-infected cutting and the other 4 with 1 healthy heat-treated cutting per pot. The pots of the last series were placed side by side to allow the leaves of the developing plants to mingle freely to determine whether there was any possibility of transmission through the aerial parts.

All experimental plants were kept in the greenhouse and periodically sprayed to control insects. The plants were examined for the symptom when about 6 months old by cutting the stems longitudinally to find the characteristic rusty red-colored fibrovascular bundles in the nodal region.

RESULTS AND DISCUSSION

The results obtained as to the transmission of the ratoon-stunting virus through the soil when either naturally or artificially infected seed pieces were planted in close contact with healthy ones are presented in the table 1.

These results add weight to the observation so far made by other investigators that the causal agent of the ratoon-stunting disease of sugarcane is not apparently transmitted through the soil and that, therefore, this natural method of spread of the disease should be disregarded. At present the only known method of control of the ratoon-stunting disease is by heat-

TABLE 1.—*Results of experiments with sugarcane to study transmission of ratoon stunting through the soil*

Treatment No.	Description of treatment	Infected cuttings planted	Infected cuttings—		Healthy cuttings planted	Healthy cuttings—	
			Showing symptom	Not showing symptom		Showing symptom	Not showing symptom
1	Diseased cutting separated from healthy by wooden stake in same pot	20	14	6	20	0	20
2	Inoculated cutting separated from healthy by wooden stake in same pot	16	15	1	16	0	15[1]
3	Diseased and healthy plants in separate pots with leaves intermingled	4	4	0	4	0	4

[1] 1 cutting did not germinate.

treating the infected cane to inactivate the virus. The discovery that there is no likelihood of reinfection of the treated cane in the field, as in the case of the chlorotic-streak virus, emphasizes the effectiveness of the present method of control.

SUMMARY

This paper presents an account of some experiments conducted under laboratory conditions to determine whether the causal agent of the ratoon-stunting disease of sugarcane could be transmitted from infected to healthy cane through the soil. The results demonstrated that, under the conditions of the experiment, no transmission of the infective agent from diseased to healthy plants occurred, even though the plants were grown in close contact in the soil for several months. No transmission through contact of

the aerial parts was observed either. The results tend to indicate that the infection or reinfection through the soil of heat-treated cane used in the control of the disease is extremely difficult if not impossible.

RESUMEN

Este estudio presenta los resultados de experimentos llevados a cabo en el laboratorio con el objeto de determinar si el agente causal del enanismo del retoño de la caña de azúcar puede trasmitirse a través del suelo. Los resultados demuestran que no ocurrió tal trasmisión, aún cuando las plantas se desarrollaron en el suelo en estrecho contacto unas con otras. Tampoco se observó caso alguno de trasmisión en aquellas plantas que, aunque sembradas en distintos tiestos, se mantuvieron lo suficientemente juntas como para que sus hojas se entrelazaran durante el curso del experimento.

Por lo tanto, los resultados obtenidos indican que la infección, o bien la reinfección de la semilla tratada con calor para inactivar el virus es sumamente difícil, si no imposible a través del suelo.

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