Residual Effect of Filter-Press-Cake Applications on Pineapple Yields

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INTRODUCTION

Extensive pot tests conducted in the open, the results of which are reported elsewhere (*1*, *2*)[2], have demonstrated the beneficial effect of filter-press cake upon pineapple yields. Subsequent work at two different locations has confirmed these previous results and shown that the use of filter-press cake under field conditions and in conjunction with fertilizer could be of considerable importance in reducing farm expenses, as well as in increasing crop yields and farm income (*3*). The beneficial effect of filter-press cake on crop yields has been partly explained on the basis of increased fertility level and improved soil physical conditions (*4*).

The practical value of the effect of filter-press cake under field conditions in warm tropical countries has not passed unquestioned. The main objection raised against its use is that its beneficial effects are of short duration because of the quick oxidation of organic residues in tropical soils. Such objection is probably valid if the effects of filter-press cake are to be considered over an extended period. However, the possibility still remains that filter-press cake may have some beneficial residual effect upon soils and crops during a limited period. It was this consideration which suggested the necessity of performing several experiments in the field in order to test the possible residual influence of filter-press cake on yields.

This paper reports data obtained from an experimental field at Arecibo where a study was conducted to determine the residual effect, if any, of filter-press cake applications upon the yields of a pineapple ratoon crop harvested 30 months after the establishment of the treatment differentials.

EXPERIMENTAL PROCEDURE

A summary of some of the relevant field information relating to this filter-press cake experiment at Palo Blanco, Arecibo, is given in the following

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[2] Italic numbers in parentheses refer to Literature Cited p. 201.

tabulation:

Item	*Information*
Experimental design	Incomplete block
Replications	8
Plot size	20 x 8 feet
Number of plants per plot	45
Pineapple variety	Red Spanish
Soil type	Bayamón silty clay
Number of treatments	13
Summary of main treatments	5 rates of filter-press cake, 3 rates of fertilizer, different number of applications, lime, and iron sprays.
Date of filter-press-cake application	Sept. 18, 1950.
Month of plant-crop harvest	Apr. 1952
Date of ratoon-crop harvest	Mar. 19, 27, and Apr. 10, 1953

Additional details for each soil treatment can be obtained from table 1.

TABLE 1.—*Mean pineapple yields per acre of the ratoon crop at the filter-press-cake experimental field, Palo Blanco, Arecibo*

Treatment identification letter[1]	Filter-press-cake application per acre	Fertilizer		Mean yield of fruit per acre
		Quantity per acre and analyses	Applications	
	Tons		*Number*	*Tons*
A	8	1,500 lb. 12-6-10	2	14.43
B	16	1,500 lb. 12-6-10	2	14.57
C	24	1,500 lb. 12-6-10	2	16.98
D	32	1,500 lb. 12-6-10	2	16.36
E	32	1,500 lb. 12-6-10	1	15.46
F	32	3,000 lb. 12-6-10	2	15.76
G	32	3,000 lb. 12-6-10	2	16.00
H	32	0	0	14.10
I	32	360 lb. NH_3 + 180 lb. P_2O_5	2	15.44
J	32	180 lb. P_2O_5 + 240 lb. K_2O	2	15.01
K	32	360 lb. NH_3 + 240 lb. K_2O	2	16.29
L	0	3,000 lb. 12-6-10	2	15.23
M	0	3,000 lb. 12-6-10 + lime[2]	2	15.45
L.S.D. at the 5-percent level				1.53
L.S.D. at the 1-percent level				2.03

[1] In all treatments, except F and L, 2 iron sprays were given to the plants as is customary in pineapple cultivation in Puerto Rico.

[2] Soil limed with an amount of calcium carbonate sufficient to raise the pH to 6.5.

The soil where the experiment was located has been classified as Bayamón silty clay, an acid, deep latosol of the northern coastal plains derived from limestone. The filter-press cake was 3 months old at the time of application and contained about 70 percent of moisture. It was worked into the top 4 to 6 inches of soil prior to planting the pineapple slips. The plant crop, details of which have been published elsewhere (*3*), was harvested in April 1952 when the plants were about 18 months old. The ratoon crop was then conditioned as is customary in commercial pineapple production, except for the fertilizer which was applied according to the treatment schedule. Fertilizer applications indicated were made on May 15 and October 15, 1952. Iron sprays were applied when required, that is, towards the middle of May and October of the same year.

To induce flowering the plants were treated with acetylene on November 15, 1953, some 5 months prior to harvesting. This treatment consisted in spraying the crown of the plant with 25 to 30 ml. of a solution made by dispersing 2 ounces of calcium carbide in 5 gallons of water in a closed container.

In March and April 1953, when the plantation was over 30 months old, the fruits were harvested as is usual in commercial practice. All fruits were weighed and the data on yield per acre were statistically analyzed.

RESULTS AND DISCUSSION

Data on mean yield of pineapple fruits per acre are given in table 1. A study of the data reveals that applications of 24 to 32 tons of filter-press cake to the acre, in conjunction with 1,500 pounds of a 12–6–10 fertilizer, were sufficient for maximum yields of a pineapple ratoon crop under the conditions that prevail at Arecibo. Complete omission of the fertilizer (treatment H) led to significant reductions in fruit yield even when the maximum quantity of filter-press cake was used (compare with treatments F and G). Thus it is evident that the use of filter-press cake alone is not a sound practice in pineapple fields.

Applications of a complete fertilizer at the rate of 3,000 pounds to the acre, even when filter-press cake was omitted (treatments L and M), were sufficient for relatively high yields. However, a consideration of the costs involved would favor the application of 24 to 32 tons of filter-press cake in conjunction with 1,500 pounds of fertilizer (treatments C to E) rather than the use of larger amounts of fertilizer without filter-press cake. The price of fertilizer and the expense of its application are rather high. On the contrary, filter-press cake can be obtained free from most sugar mills and hauled to the farm at a relatively low cost.

Whether the fertilizer was applied all at once or split into two applica-

tions had no effect on the final yields of fruits. Spraying with ferrous sulfate was not effective either. The supply of available iron in Bayamón silty clay was apparently plentiful enough for pineapple growth and production under the conditions in which this experiment was conducted. These results are in line with those obtained in previous experiments (*1*, *2*, *3*).

Table 1 further shows that single omissions of each of the major fertilizer elements, nitrogen, phosphoric acid, or potash (treatments J, K, and I, respectively) did not significantly reduce yields when filter press-cake was used. (Compare treatments J, K, and I with treatments F and G). Results from the plant crop were identical as far as phosphoric acid and potash are concerned. However, omission of nitrogen for the plant crop caused significant reduction in fruit yields (*3*). Perhaps the needs of well-established pineapple ratoon crops for nitrogen are less than those of the quick-growing young plants. Furthermore, there might be a more effective release of nitrogen from the filter-press cake as time advances.

All the results already discussed, except the ones concerning lack of response to nitrogen, confirm those obtained for the plant crop at the same location on the previous year (*3*). In Arecibo and related areas considerable savings can be made without reducing yields by using filter-press cake in conjunction with smaller doses of commercial fertilizers than those generally applied.

In the report issued about the results obtained from the plant crop it was stated (*3*):

> The economic implications of applying only half of the fertilizer generally used, when filter-press cake is available, can be far-reaching in areas where conditions similar to those around Arecibo prevail. About the same bulk of pineapple can be produced much cheaper by using 1,500 pounds of fertilizer and filter-press cake than when 3,000 pounds to the acre of fertilizer are used.

The results herein reported provide information of much practical value. The same previous statement concerning the plant crop holds for the ratoon crop harvested 30 months after applying the filter-press cake. The measurable beneficial effects of these treatments are gratifying. They guarantee sustained high fruit yields over a relatively long period including a complete 2-crop cycle. Whether or not these effects could be measured for longer periods is something which cannot be ascertained.

SUMMARY

Data are presented here on the fruit yields obtained from a pineapple ratoon crop at Arecibo where various rates of filter-press cake and fertilizers were tested. The filter-press cake was applied 30 months prior to harvesting the ratoon crop. The plant crop was harvested 12 months earlier. Fertilizer for the ratoon crop was applied after harvesting the plant crop. Pineapple

plants grown in soil receiving 24 to 32 tons of filter-press cake to the acre, in addition to 1,500 pounds of a 12–6–10 fertilizer, produced yields as high as, or even significantly higher than, plants growing in soil receiving twice as much fertilizer but no filter-press cake.

The possibilities of using filter-press cake more extensively in pineapple fields in the Arecibo area, in conjunction with smaller doses of fertilizers than are generally used, must be considered by growers. The residual effect of the filter-press-cake applications will reduce the fertilizer bill considerably in pineapple ratoon-crop cultivation.

RESUMEN

Se presentan aquí los datos de rendimiento de un retoño de piña sembrado en un campo experimental en Arecibo. En este experimento se estudiaron varios niveles de cachaza y abono, desde el punto de vista de su influencia sobre la producción. La cachaza se aplicó 30 meses antes de cosechar la fruta. Doce meses antes se había cosechado el fruto de la plantilla. El abono para el retoño se aplicó después de la plantilla.

Los rendimientos de las plantas de piña sembradas en el suelo que recibió de 24 a 32 toneladas de cachaza por acre junto con 1,500 libras de abono 12–6–10, fueron en algunos casos iguales y en otros significativamente superiores a los de las plantas sembradas en terreno donde se había aplicado el doble de la cantidad de abono antes mencionada, pero ninguna cachaza.

Los resultados de este experimento son económicamente significativos, ya que demuestran que es posible usar la cachaza de manera más ventajosa de lo que hasta ahora se ha venido haciendo. Esta afirmación cobra particular importancia si tomamos en cuenta el hecho de que con la cachaza y el abono usado en cantidades menores de las acostumbradas se consiguen rendimientos altos. No hay duda, pues, de que el efecto residual de las aplicaciones de cachaza reducirá considerablemente los gastos de abono en el cultivo de los retoños.

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