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Table

Effect of potassium on N, P and K concentrations in the dry matter of leaves

Treatments	Nitrogen (%)			Phosphorus (%)			Potassium(%)		
K g/plant	Pre-shooting	Shooting	Harvest	Pre-shooting	Shooting	Harvest	Pre-shooting	Shooting	Harvest
0	3.6	2.8	2.7	0.24	0.16	0.24	1.39	1.66	1.36
86	3.3	2.7	2.6	0.24	0.17	0.21	1.24	2.48	1.22
172	3.2	2.3	2.1	0.30	0.21	0.21	2.30	3.08	2.24
258	3.0	2.5	2.4	0.30	0.16	0.22	1.68	3.38	1.64
344	2.6	2.4	2.2	0.30	0.15	0.21	2.65	2.13	2.59
SEM	0.06	0.06	0.04	0.015	0.005	0.005	0.021	0.022	0.051
CD (P=0.05)	0.1	0.1	0.1	0.03	0.01	0.01	0.04	0.04	0.11

Enhanced resistance of banana plants (Dwarf cavendish) to *Fusarium oxysporum* f. sp. cubense by controlled Zn nutrition under field conditions.

In a previous paper (1983a) we have found a relation between the Zn content of banana soils and the incidence of the *Fusarium* wilt of banana (Panama disease) in the Canary Islands. Later (1983b) we hypothesized about the role played by the Zn nutrition on the tylose formation in the xylem of infected banana roots.

We have worked the last five years trying to confirm our hypothesis under controlled conditions. Different long term experiments were conducted in a growth chamber by growing banana plantlets (from tissue culture) in nutritive solutions that were inoculated with a canary strain of *Fusarium oxysporum* f. sp. cubense. The results obtained have been in accordance with the above hypothesis (unpublished data).

We undertook this research to evaluate the role played by nutritional Zn disorders on the *Fusarium* wilt of banana under field conditions.

In March of 1987 we selected a banana plantation in the south of Tenerife (Canary Islands) that presented a strong incidence of Panama disease. As a consequence of the high percentage of disease observed in a zone of the plantation (higher than the mean percentage of disease presented by the whole plantation), the banana plants from this zone were removed and the soil worked in 1986. We have chosen this zone as our experimental area. It has a high pH (8.3). At the beginning of our research in the spring of 1987 the irrigation was changed to a drip system (Before this the plot had a sprinkler irrigation system). The experimental area of 648 plants was divided in

two plots. At the initiation of the experiment the banana plants were 8 months old. The control and treated area received the same NPK fertilization, according to data from soil analysis.

The difference between both plots lies in the fact that in the treatment plot, ZnSO_4 (10 g/plant/month) and Zn chelate (Librel-Zn: 14% Zn, EDTA; 5 g/plant/month) were added through the irrigation system for 3 years; on the contrary, the control plot did not receive Zn fertilizer during the same period.

1987 (initial state): It is deduced from the Table that there is not a significant difference between the treatment and control plots at the beginning of the experiment in relation to the percentages of diseased plants.

1988 (after 1 year of Zn treatment): There is not a significant difference in the percentages of diseased plants between both plots (Table). Zn treatment apparently showed no fungitoxic effect by itself, because no significant differences in relation to the percentages of diseased plants in both plots were detected after a year.

1989 (after 2 years with Zn treatment): We can observe a significant difference between the treated plot and the control in relation to the percentage of diseased plants (Table). Statistical analysis was performed comparing the number of diseased plants per each row in the treatment plot with the number of diseased plants per row observed in the control plot using an ANOVA with randomized complete blocks (LSD = 2.60, significance level 0.01).

After the second year it seems that the Zn treatment has influenced the resistance mechanisms of the banana plants giving a significant difference between the treatment plot and the control. This difference was evident in spite of a pronounced increase in Panama disease following strong winds from December of 1988 to June of 1989.

1990 (after 3 years with Zn treatment): There is a significant difference between the plots in relation to the percentages of diseased plants (treatment plot 6.3%, control plot 18.9%) (Table). This difference is higher than was observed in 1989 (treatment plot 23.2%, control plot 36.9%). With an ANOVA using a randomized complete block as in 1989, a LSD of 1.84 was obtained at a significance level 0.01.

In spite of the heavy Zn fertilization applied to the treatment plot during the three years of the experiment neither phytotoxic effects of Zn nor a decrease in yield per plant were observed when compared to the control plot.

The incidence of Panama disease under field conditions is affected by several factors. The decrease in the disease incidence in the treated plot (1989 and 1990) is apparently due to the Zn added under our experimental conditions. The losses avoided by the Zn treatment in the experimental area can be valued at about 4000 dollars/ha/year in 1990, after three years of treatment.

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Table 1: Number and percentage of banana plants with Panama disease in a plot fertilized with Zn (treatment plot) and in one without Zn fertilization (control plot) during three years.

	No. diseased plants	% diseased plants
March 1987 (Initial state)		
Treatment plot	29	8.7
Control plot	22	6.9
March 1988 (first year)		
Treatment plot	49	14.8
Control plot	42	13.2
September 1989 (second year)		
Treatment plot	77	23.2
Control plot	117	36.9
September 1990 (third year)		
Treatment plot	21	6.3
Control plot	60	18.9

Treatment plot: 331 plants; Control plot: 317 plants.