Supplementary Material for

Dissolution of potassium silicate rocks with *Acidithiobacillus thiooxidans* biogenic acid: characterization and agronomic performance of the end-products

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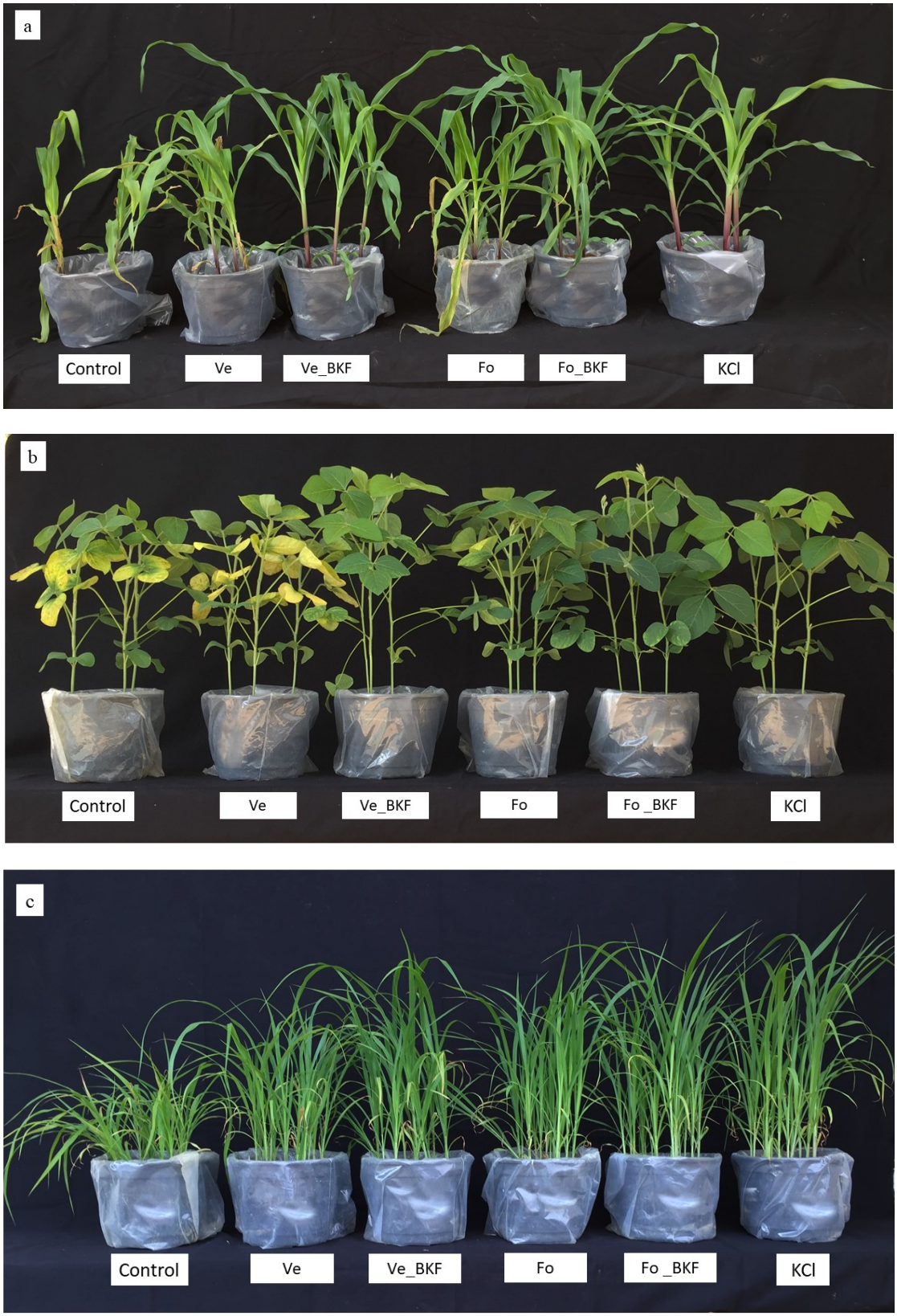

Fig. A.1. Response of corn (a), soybean (b) and millet (c) plants to application of verdete (Ve) and phonolite (Fo) rocks, and verdete (Ve-BKF) and phonolite (Fo-BKF) biogenic K-fertilizers and KCl at a dose of 200 mg dm^{-3} K, compared to control plants without K aplication. Pictures were taken at 32, 40 and 30 days after sowing corn, soybean and millet, respectively.

Table A.1. Equations of recovered K contents by crop (ŷ, mg dm^{-3}), according to the K doses (x, mg dm^{-3}) of each fertilizer (KCl, verdete (Ve) and phonolite (Fo) rocks, and verdete (Ve-BKF) and phonolite (Fo-BKF) biogenic K-fertilizers, coefficient of determination (R^2) and K recovery rate (Krr).

Fertilizer	Equation	R^2	Krr
	CORN		
KCl	$\hat{y} = 9.87 + 0.61$ x	0.99	0.61
Fo-BKF	$\hat{y} = 9.09 + 0.08$ x	0.98	0.08
Ve-BKF	$\hat{y} = 8.65 + 0.14$ x	0.99	0.14
Fo	$\hat{y} = \bar{y} = 9.79$		
Ve	$\hat{y} = \bar{y} = 8.14$		
	SOYBEAN		
KCl	$\hat{y} = 3.87 + 0.14$ x	0.99	0.14
Fo-BKF	$\hat{y} = 3.87 + 0.01$ x	0.86	0.01
Ve-BKF	$\hat{y} = 3.99 + 0.01$ x	0.95	0.01
Fo	$\hat{y} = 4.50 + 0.01$ x	0.94	0.01
Ve	$\hat{y} = \bar{y} = 4.67$		
	MILLET		
KCl	$\hat{y} = 8.92 + 0.08$ x	0.99	0.08
Fo-BKF	$\hat{y} = 9.25 + 0.01$ x	0.76	0.01
Ve-BKF	$\hat{y} = 9.17 + 0.03$ x	0.92	0.03
Fo	$\hat{y} = 9.55 + 0.02$ x	0.94	0.02
Ve	$\hat{y} = 9.93 + 0.01$ x	0.95	0.01
	TOTAL		
KCl	$\hat{y} = 22.67 + 0.74$ x	0.99	0.74
Fo-BKF	$\hat{y} = 22.21 + 0.10$ x	0.99	0.10
Ve-BKF	$\hat{y} = 21.82 + 0.18$ x	0.99	0.18
Fo	$\hat{y} = 22.04 + 0.05$ x	0.99	0.05
Ve	$\hat{y} = \bar{y} = 23.6$		

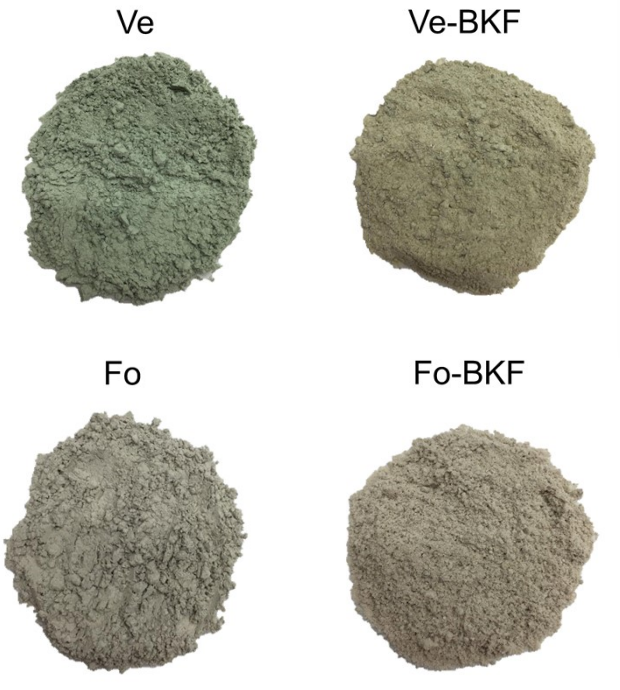

Fig. A.2. Macroscopic appearance of verdete (Ve) and phonolite (Fo) rocks before and after acidulation (BKF) with biogenic acid. BKF = biogenic K-fertilizer.

Parameters of analytical techniques used

The TXRF analyses were performed in a Shimadzu EDX-720; and the XRD analyses in a Shimadzu XRD-6000 diffractometer, using a graphite crystal monochromator to select CoKα radiation (λ = 1.7889 Å) at a rate of 1.2° 2θ min^{-1} and a 2θ range between 5° to 80°. Powder mounts were prepared by packing ground (< 75 μm) samples into Al holders. The FTIR-ATR spectra were recorded with a Perkin Elmer, model Spectrum 1000, modulo ATR, in the range from 400 to 4000 cm^{-1}, at 4 cm^{-1} resolution and 32 scans. Raman spectra were obtained using a Raman Renishaw spectrometer. The samples were measured with 785 nm laser line, 10 accumulations, exposure time of 5 s and 0.005% of power. For SEM and EDS analyses, a JEOL model JSM-6010-LA microscope integrated with an EDS probe operating at 6 kV was used to obtain secondary electron images of the samples, with magnification levels at 500x. An EDS operating at 10 kV was used to obtain the elementary chemical composition of Ve and Fo rocks.