

# Accepted Manuscript

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PII: S1434-8411(17)30379-5  
DOI: <http://dx.doi.org/10.1016/j.aeue.2017.06.010>  
Reference: AEUE 51928

To appear in: *International Journal of Electronics and Communications*

Received Date: 15 February 2017  
Revised Date: 7 June 2017  
Accepted Date: 8 June 2017

Please cite this article as: A. AboBakr, L.A. Said, A.H. Madian, A.S. Elwakil, A.G. Radwan, Experimental Comparison of Integer/Fractional-orderElectrical Models of Plant, *International Journal of Electronics and Communications* (2017), doi: <http://dx.doi.org/10.1016/j.aeue.2017.06.010>

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# Experimental Comparison of Integer/Fractional-order Electrical Models of Plant

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## Abstract

In this paper, different integer and fractional-order models are studied from electrical point of view, these models are used to fit the measured impedance data for different types of fruits and vegetables. Experimental work is done on eight different models for six types of fruits to verify the best fitting model. Electric impedance is measured in the range of frequencies (200mHz – 200Khz) using a non-destructive method, where the tissues are not damaged by electrode insertion. Moreover, two integer order models have been extended to the fractional order domain where data analysis and fitting are applied. The extra degrees of freedom of the fractional order models have enhanced the fitting parameters showing better accuracy. The double Cole Model has been found to be the best fit among different integer and fractional models based on root mean square error (RMSE).

**Keywords:** Impedance, Cole impedance, Fitting, Fractional-order models, Bioimpedance, Tissue

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