

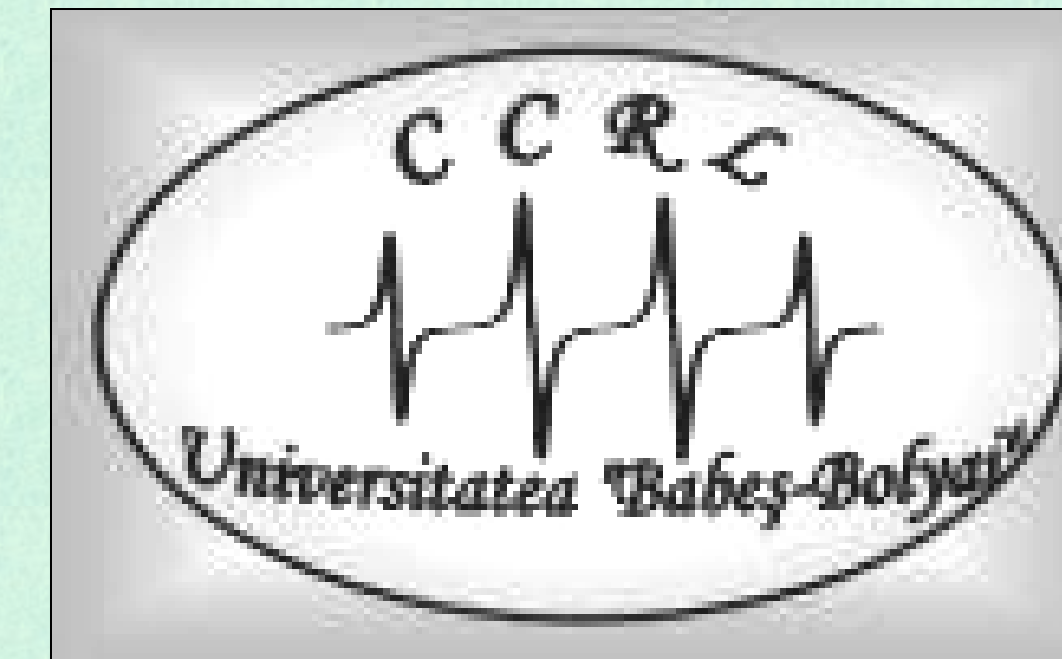


Effect of gamma radiation on some dosimetric interest compounds: an EPR study

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INTRODUCTION

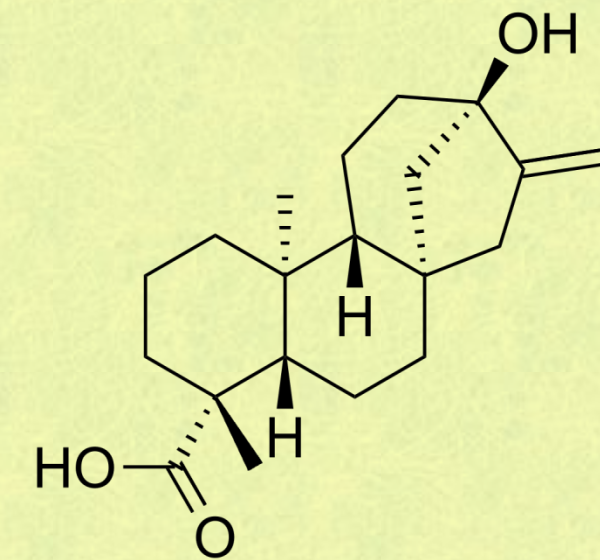
The aim of the present research was undertaken in order to investigate if natural extracts, like *steviol* and *sucrose* can be used as dosimeters, using EPR (Electron Paramagnetic Resonance) spectroscopy technique.

The natural sweeteners are extracted from plants (*Stevia rebaudiana*). These substances, such as *stevioside* and *rebaudioside*, range in sweetness from 40 to 300 times sweeter than sucrose.

EXPERIMENTAL

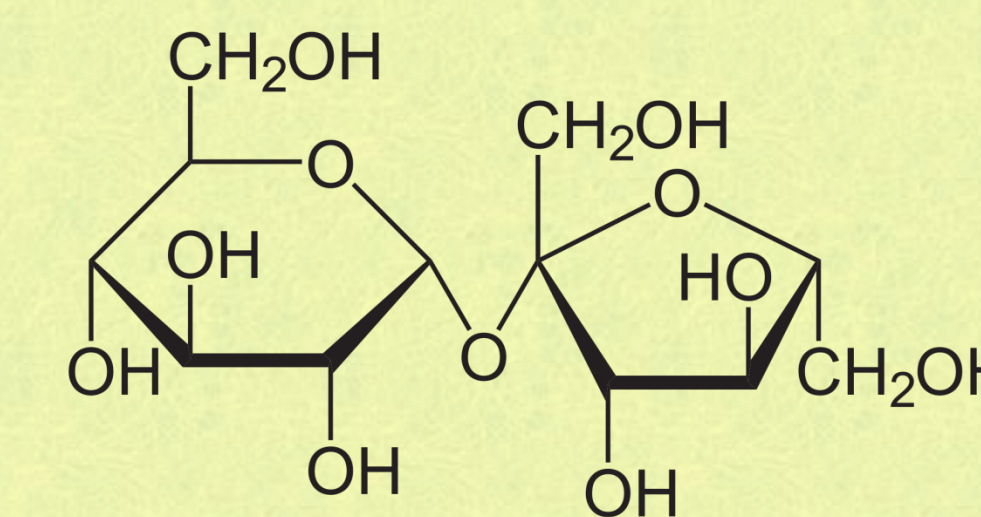
Studied samples: - Steviol (isolated from the plant *Stevia rebaudiana*);
- Sucrose.

The samples with natural sweeteners, in polycrystalline form, were exposed to the action of low doses (used in the practices of radiodiagnostic medicine and interventional radiology) of gamma radiation, generated by a ⁶⁰Co source (Gamma Chamber 600 from the Faculty of Physics), with a flow rate of D = 1.96 Gy/h.



Molecular structure of Steviol

Analysis



Molecular structure of Sucrose

EPR (Electron Paramagnetic Resonance) spectroscopy technique.

EPR Spectrometer BRUKER EMX, Bruker Corporation, operating in X-band (~9 GHz, 100 kHz), from CCRL.

RESULTS AND DISCUSSIONS

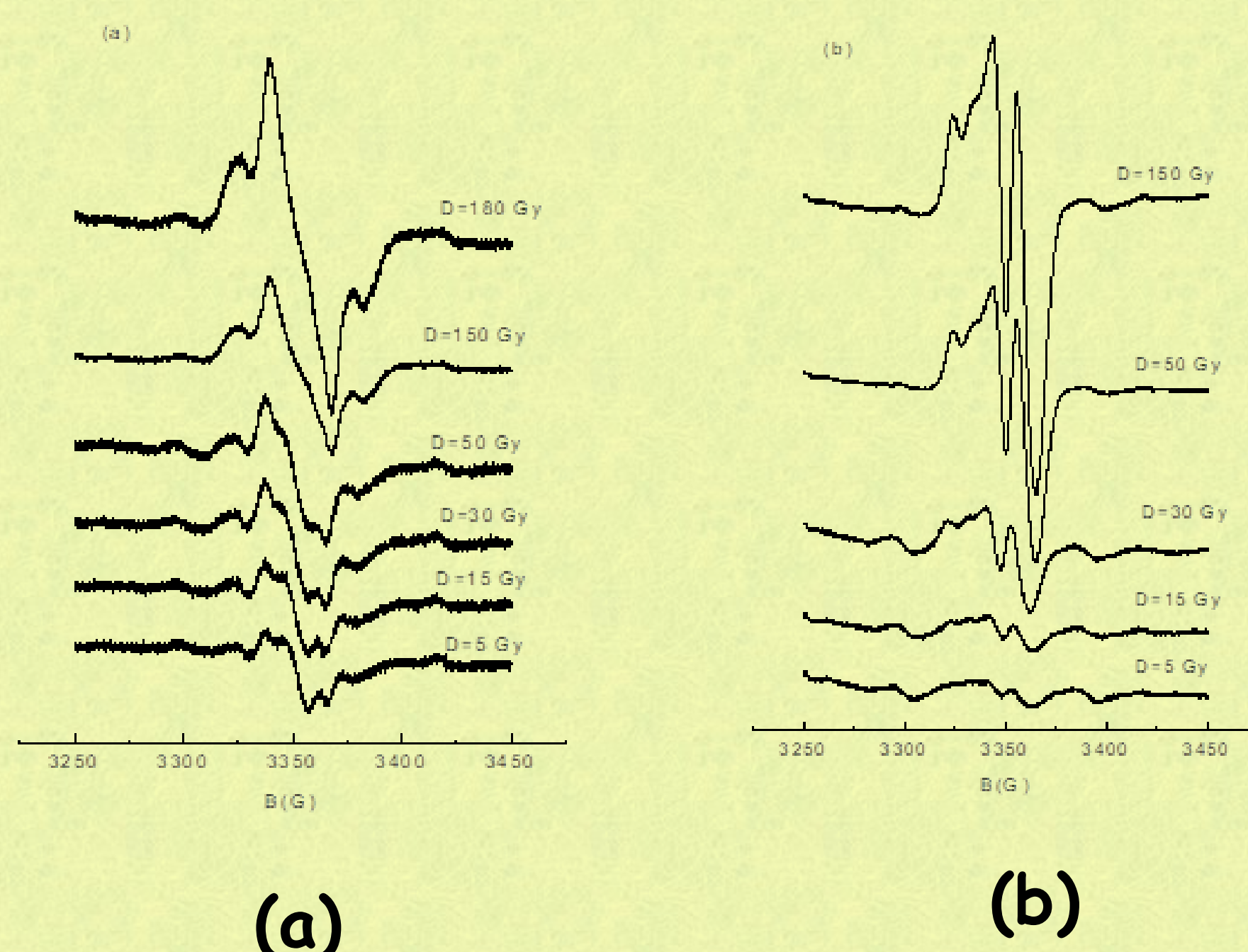


Fig. 1 EPR spectra of γ -irradiated: (a) steviol and (b) sucrose, at different absorbed doses (5 Gy to 180 Gy).

EPR spectra consist of a few lines which are characteristic for the presence of free radicals in carbohydrate compounds.

The most important property of a dosimeter is the stability over time of the radicals produced by ionizing radiation.

This means that these substances are eligible for identification of the irradiation process even after a period of time from the irradiation.

According to the present results, the stability condition of the radicals produced by the ionizing radiation in the studied samples is achieved.

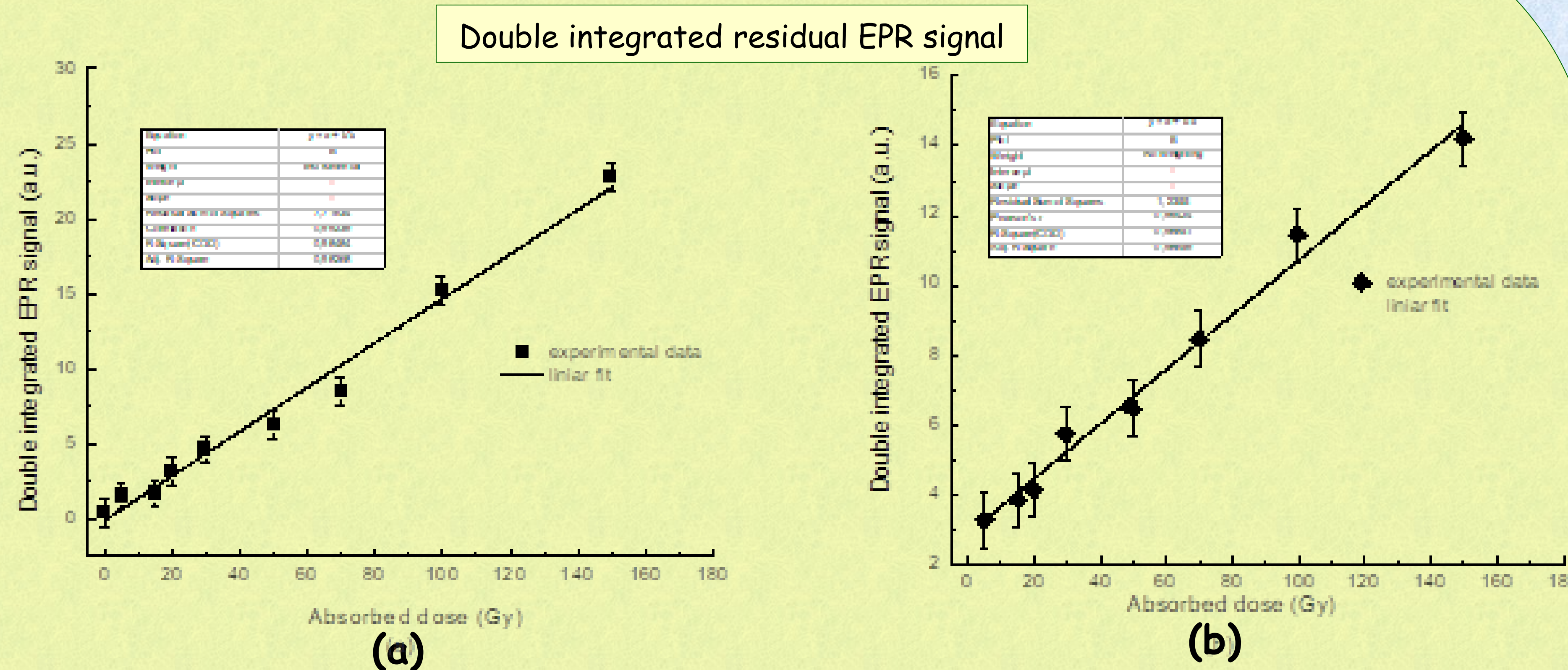


Fig. 2 Double integral of the signal depending on the absorbed radiation dose for: (a) steviol and (b) Sucrose

Dependence of EPR signal intensities on the absorbed dose.

By γ - irradiation the amount of generated radicals shows a linear dependence, which mean that there exist the possibility to use these two compounds as EPR dosimeters.

Conclusion: From the analysis of the obtained results it was found that the studied samples largely meet the requirements imposed on a dosimeter.

The non-irradiated samples show no EPR signal, the condition of linearity between dose and response is accomplished and the stability condition of the radicals produced by the ionizing radiation in the studied samples it is achieved too.

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