

# Evaluation on Physical Properties of Irradiated Collards (*Brassica oleracea* L *var. acephala*)

T.C.F. Nunes<sup>1</sup>, V.D. Rogovschi<sup>1</sup>, R.C. Duarte<sup>1</sup>, R.N.M. Pitombo<sup>2</sup>, J. Mancini-Filho<sup>2</sup>  
and A.L.C.H. Villavicencio<sup>1</sup>

<sup>1</sup> Instituto de Pesquisas Energéticas e Nucleares, São Paulo, Brasil

<sup>2</sup> Faculdade de Ciências Farmacêuticas da Universidade de São Paulo, São Paulo, Brasil





# Objective

The objective of this study was to evaluate the color of irradiated kale.

## Material and methods



Samples of collards greens (*var. acephala*) were supplied by Hydrofarm Manufacture at São Paulo city.



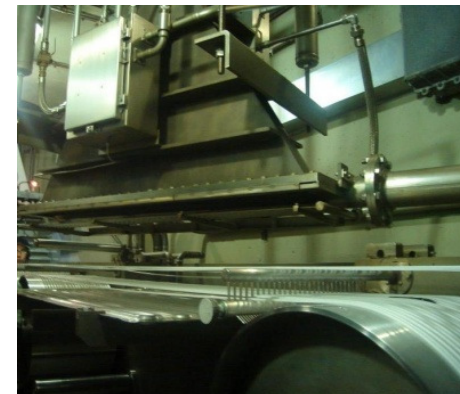
## Sample preparation

Samples of whole kale were obtained and put into the isothermal box previously refrigerated with ice to maintain the temperature nearly 5°C during the transportation.

Stalks were removed, samples did not exceed 3.5 mm height and leaflets of kale were sanitized, placed in a polyethylene bag and stored at refrigerated temperature ( $4 \pm 1$  °C).

## Irradiation

Samples were irradiated in ambient temperature at IPEN-CNEN Electron Accelerator, a Dynamitron Machine (Radiation Dynamics Co. Model JOB-188, New York, USA). Applied doses were 0 (control) 1.0, 1.5kGy.



# Measurement of color

Color values for collards were measured on days 1, 3, 6 and 8.



“L” (lightness; 0 = dark and 100 bright)



“a” (negative = greenness and positive = redness)



## 2.5 Statistical analysis

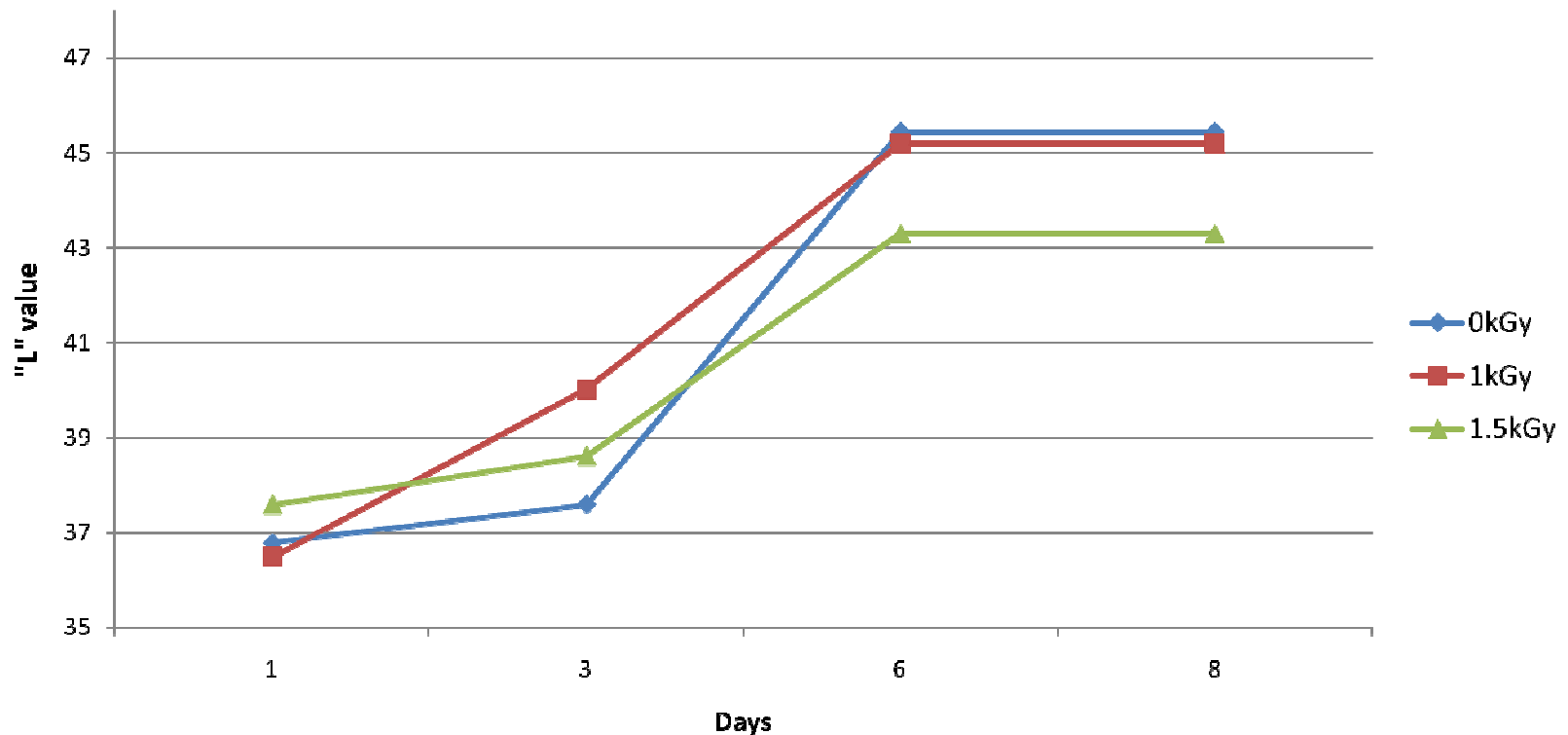
Statistical analysis of the results was done using analysis of variance One-way ANOVA and was processed with *GraphPad Prism 5*.

# “L” value

100

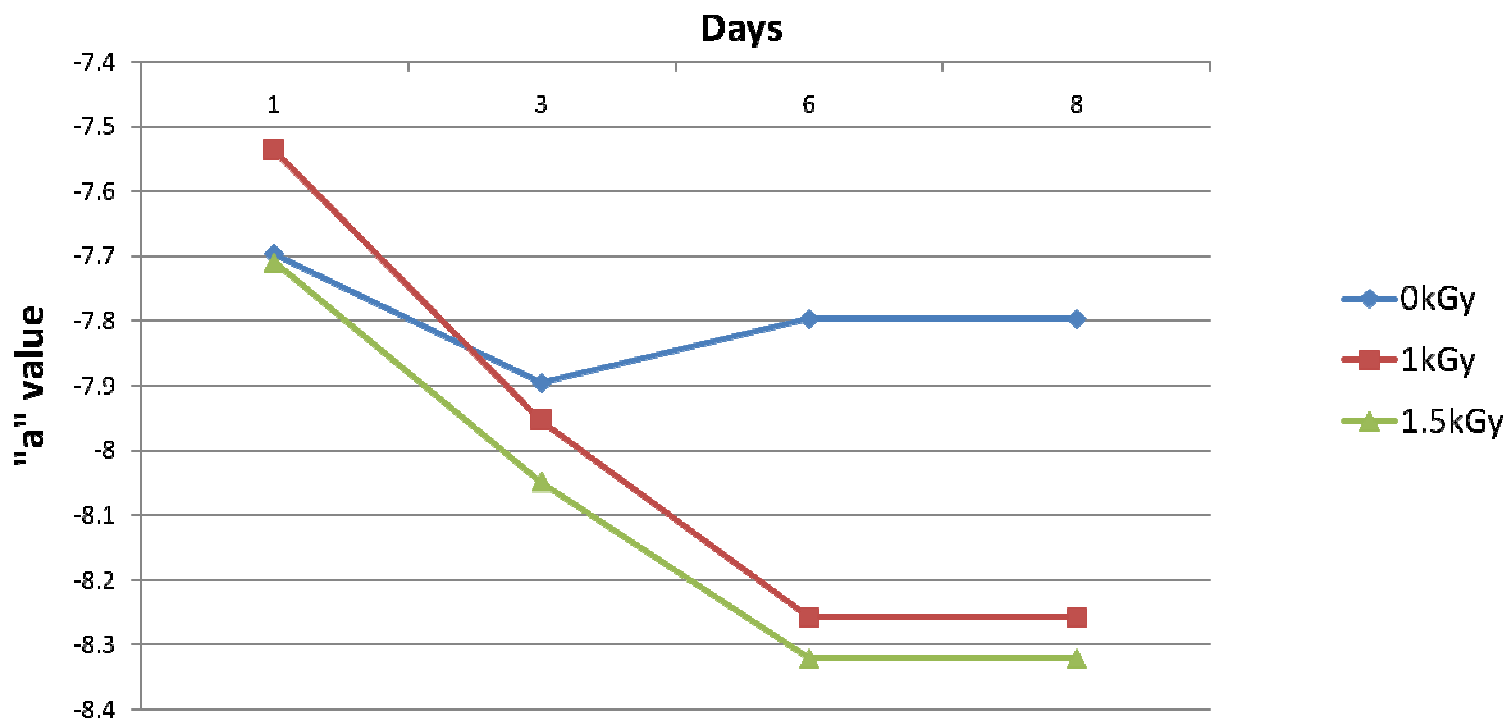


0



According to the analysis of variance, for values “a”, the collards samples showed significant differences ( $p < 0.05$ ) between the days 1 to 3; 1 to 8 and 3 to 6. With the samples irradiated with doses of 1.0kGy, the differences happened between the days 1 to 6 and 1 to 8. Samples treated with 1.5kGy did not show significant differences, maintaining the green color.

# "a" value



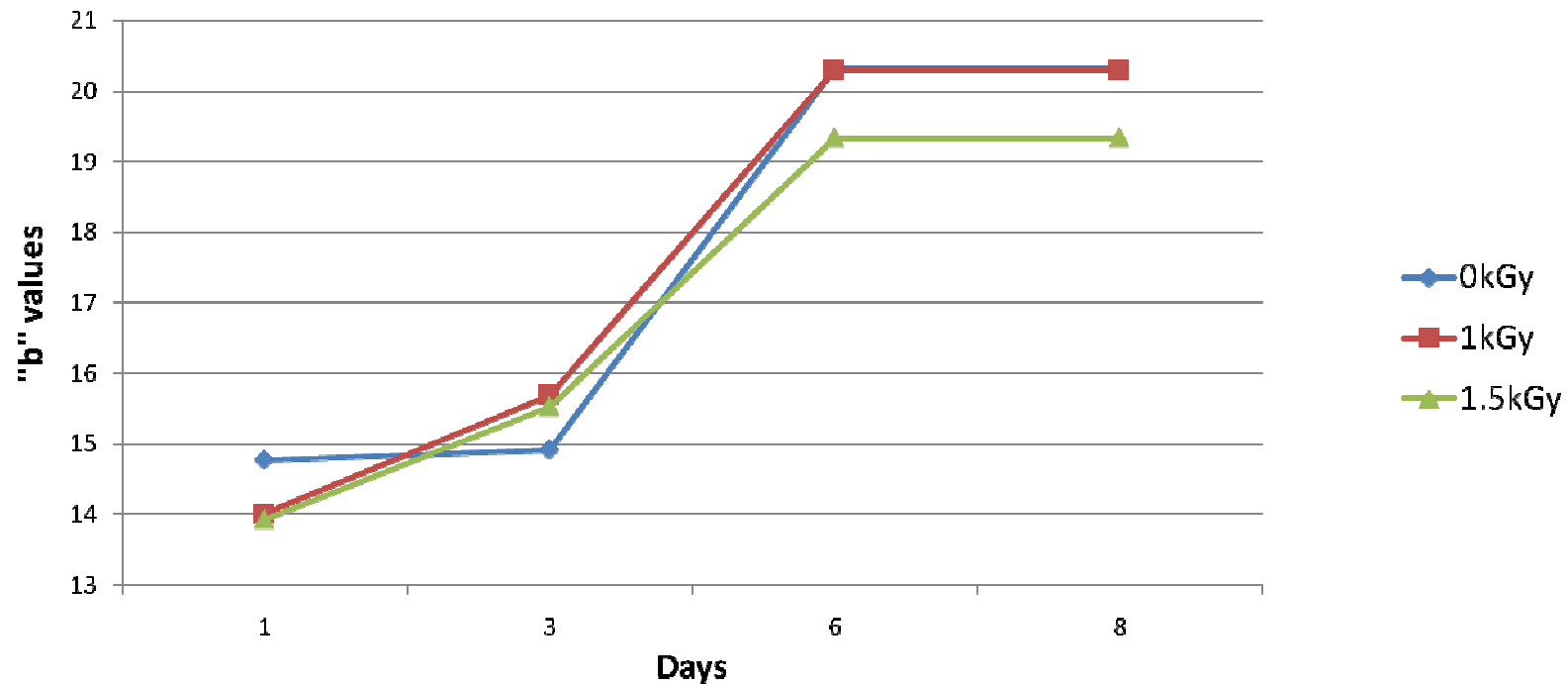
According to the analysis of variance, for values "a", the collards samples showed significant differences ( $p < 0.05$ ) between the days 1 to 3; 1 to 8 and 3 to 6. With the samples irradiated with doses of 1.0kGy, the differences happened between the days 1 to 6 and 1 to 8. Samples treated with 1.5kGy did not show significant differences, maintaining the green color.

# "b" value

+



-



No significant differences were observed for value "b", between control sample (0kGy) and irradiated sample with a dose of 1.5kGy, during the days 1 to 3 and 6 to 8; however, significant differences could be observed for the other days. Only the first day showed significant difference between the samples treated with 1.5kGy and the Control sample (0kGy).

# Conclusion

In our study, under our conditions, color quality attribute of collards did not change when submitted to e-beam treatment, with doses of 1.0 and 1.5kGy, for the fresh product package, at controlled refrigerated temperature. No significant effects, due to the irradiation treatment, were observed in the color of the collards greens.



## Acknowledgments

The authors would like to thank Hydrofarm for the samples, to FCF/USP and the technical support of Alexandre Mariani Rodrigues, to IPEN-CNEN, CNPq and IAEA for the financial support and to Eng<sup>o</sup> Elizabeth S. R. Somessari and Carlos Gaia da Silveira IPEN-CTR for the irradiation samples.