INTERNATIONAL SYMPOSIUM
ON UTILIZATION OF ACELLERATORS - ISUA 2005

EFFECT OF IONIZING RADIATION ON TILAPIA *(Oreochromis niloticus)* PROTEIN BIOFILMS

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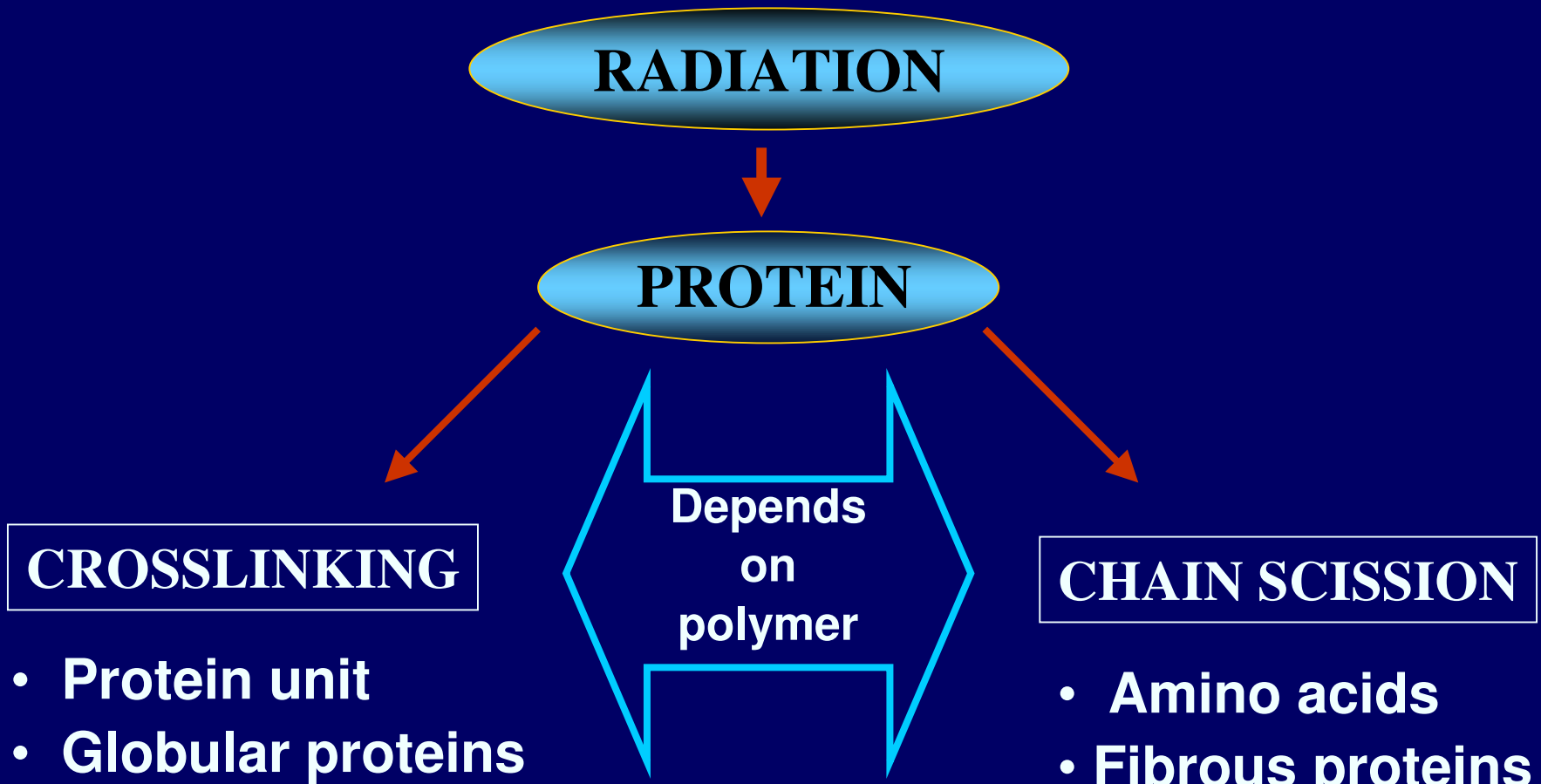
INTRODUCTION

FILMS

NATURAL POLYMER x SYNTHETIC MATERIAL

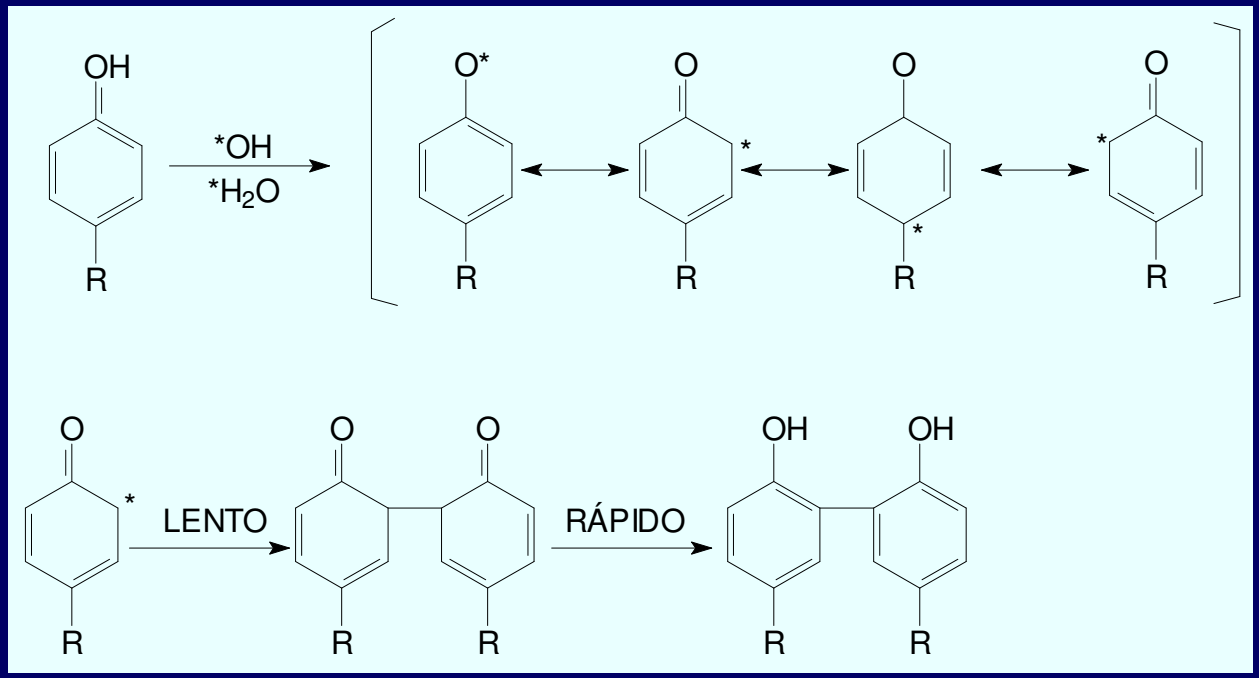
- Traditional packaging from petroleum
- New developments on films
  - Starches, cellulose derivatives, waxes, pectin, alginates, proteins
  - Thermal treatment, pH adjustments, cross-linking agents

INTRODUCTION



INTRODUCTION

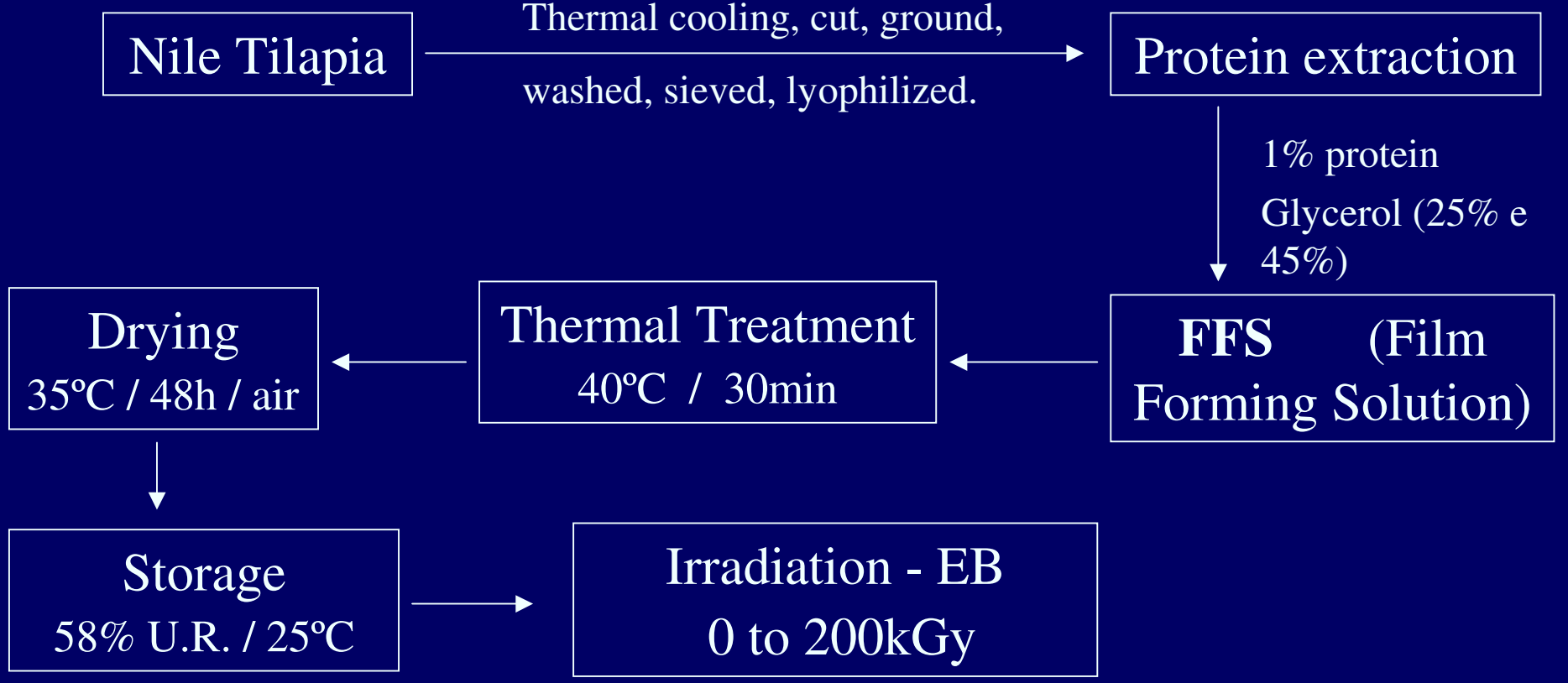
$$H_2O \xrightarrow{\gamma} {}^{\cdot}OH,\ {}^{\cdot}H,\ H_2O_2,\ H_2,\ e_{aq}^-$$



OBJECTIVE

The aim of this paper was to study the effect of ionizing radiation on films made from Nile Tilapia ***(Oreochromis niloticus)*** myofibril proteins.

METHODOLOGY



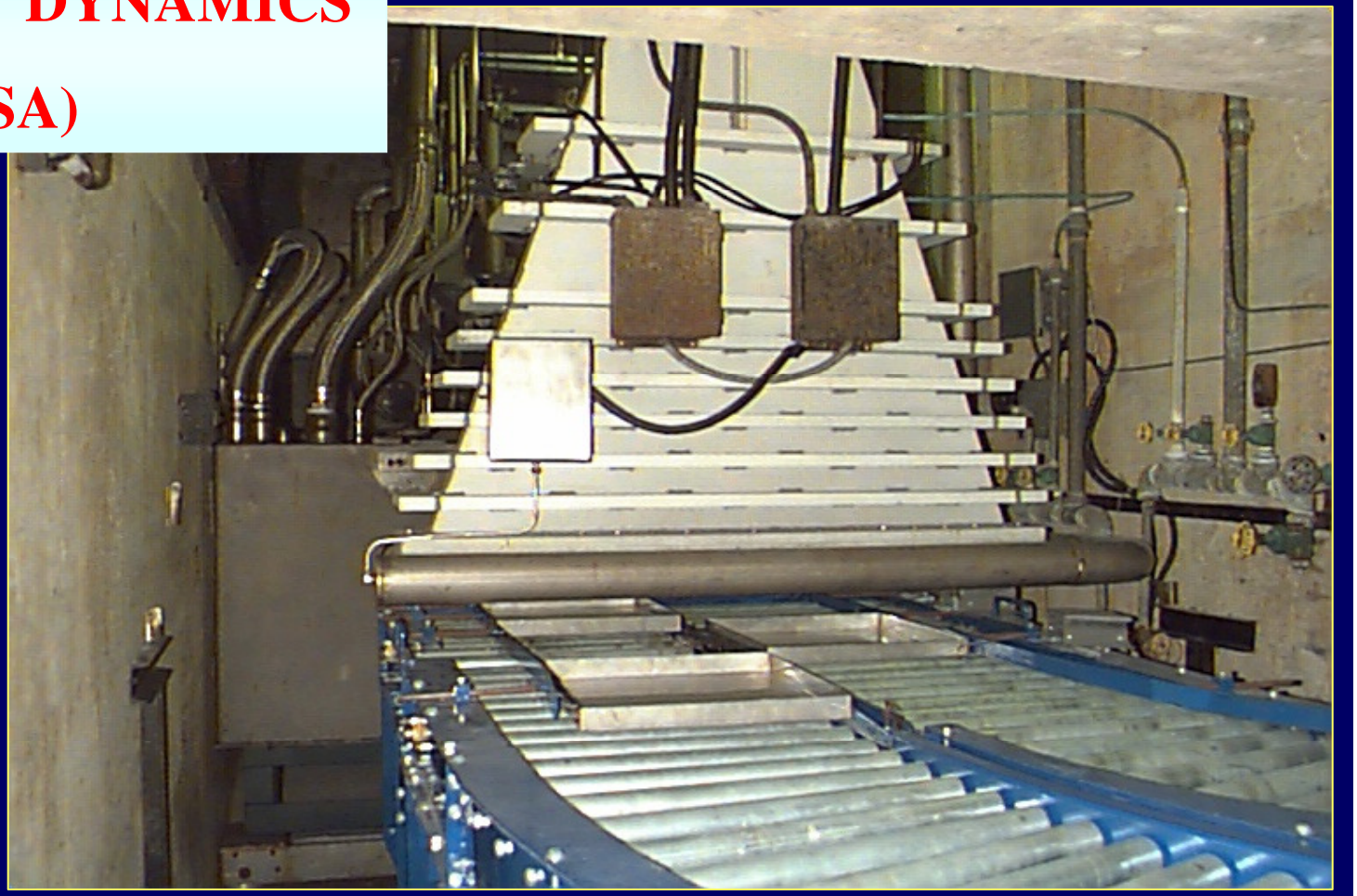
METHODOLOGY

RADIATION DYNAMICS

(USA)

2.01 mA

0.550 MeV



METHODOLOGY

MEASUREMENTS AND EQUIPMENTS

- Color — HunterLab XE Colorimeter

$\Delta E = [(L - L_s) + (a - a_s) + (b - b_s)]^{0.5}$

where L_s*, a_s* and b_s* were CIELab parameters for blank standard.

- Opacity — HunterLab XE Colorimeter

$Y = (Yp / Yb) \times 100$

where Yp and Yb were CIELab parameters for black and blank standards, respectively

- Solubility (dry mass loose)

- Mechanical properties — TA.XT2i Texturometer

Tensile strength (force/initial cross-sectional area); deformation at break ($\Delta l/l_0$); elastic modulus.

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RESULTS

OPACITY, COLOR AND SOLUBILITY MEASUREMENTS

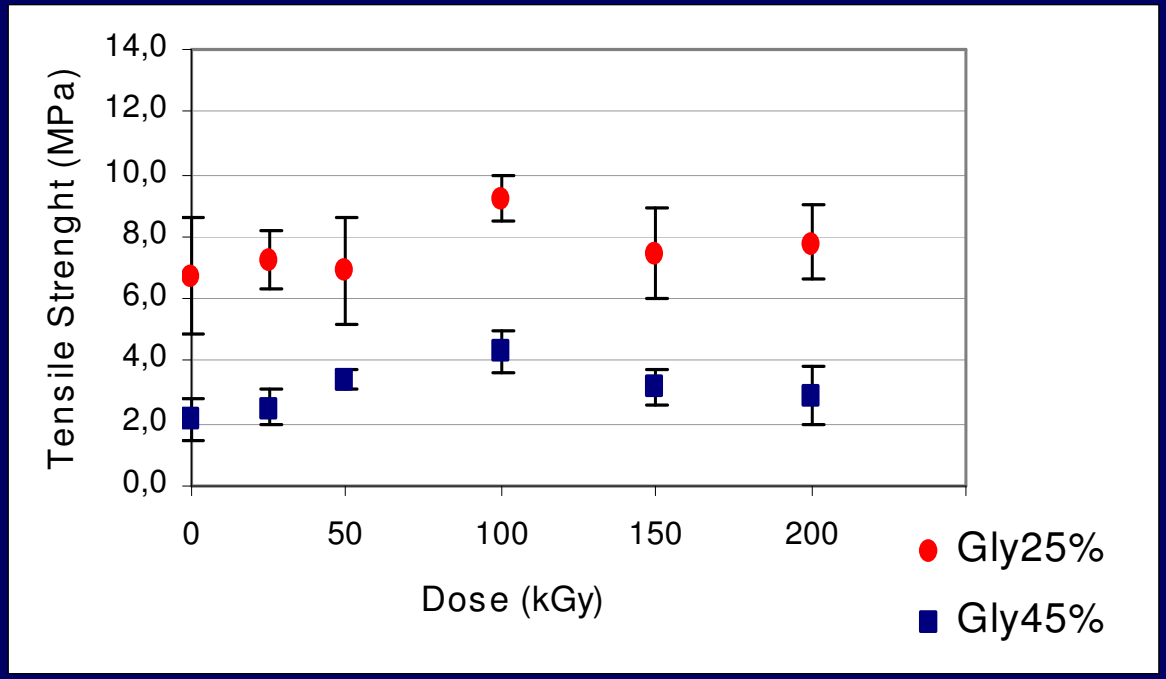
25% Glycerol →

Dose(kGy)	Opacity	Color	Solubility
0	4.6 ± 0.8 ab	17.9 ± 0.6 ab	16.3 ± 1.5 a
25	5.4 ± 0.4 b	20.0 ± 2.3 bc	17.5 ± 0.6 a
50	4.5 ± 0.4 ab	15.6 ± 1.4 a	16.1 ± 1.8 a
100	3.8 ± 0.9 a	18.2 ± 1.0 ab	17.1 ± 1.7 a
150	5.4 ± 0.8 b	21.4 ± 1.8 c	15.5 ± 1.5 a
200	3.6 ± 0.5 a	19.0 ± 1.3 bc	15.4 ± 0.6 a

Films based on sardine myofibril protein:	33 to 47%
Films based on rice protein concentrate:	35.3 to 76.4%
Films based on isolated milk whey protein:	above 50%
Films based on isolated soy protein:	26.8 to 39.4%

RESULTS

TENSILE STRENGHT (Mpa)



Dose (kGy)	25% Glycerol	45% Glycerol
0	6.74 ± 1.83 a	2,13 ± 0.64 a
25	7.26 ± 0.97 a	2,49 ± 0.57 ab
50	6.91 ± 1.70 a	3,40 ± 0.34 b
100	9.24 ± 0.70 b	4,32 ± 0.69 c
150	7.46 ± 1.47 ab	3,19 ± 0.55 b
200	7.80 ± 1.19 ab	2,94 ± 0.93 ab

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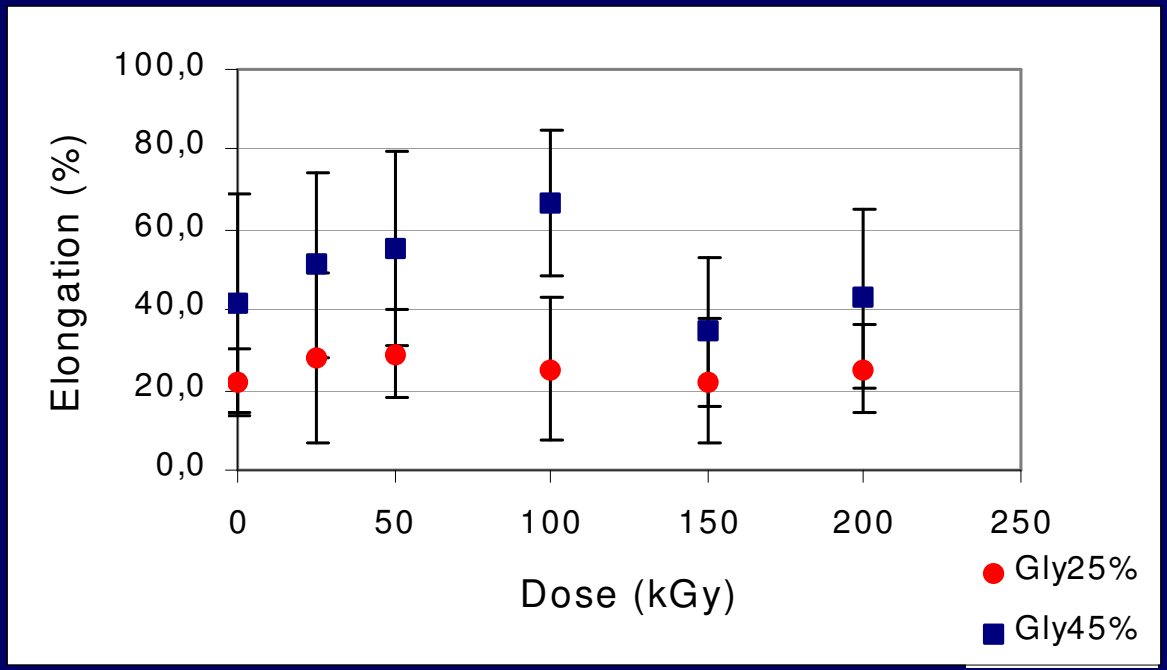
RESULTS

ELONGATION

(%)



Dose (kGy)	25% Glycerol	45% Glycerol
0	22.0 ± 8.1 a	41.6 ± 27.3 a
25	28.0 ± 21.0 a	51.2 ± 22.9 a
50	29.1 ± 10.9 a	55.3 ± 24.3 a
100	25.3 ± 17.8 a	66.7 ± 18.3 a
150	22.1 ± 15.6 a	34.5 ± 18.7 a
200	25.4 ± 10.7 a	42.8 ± 22.1 a

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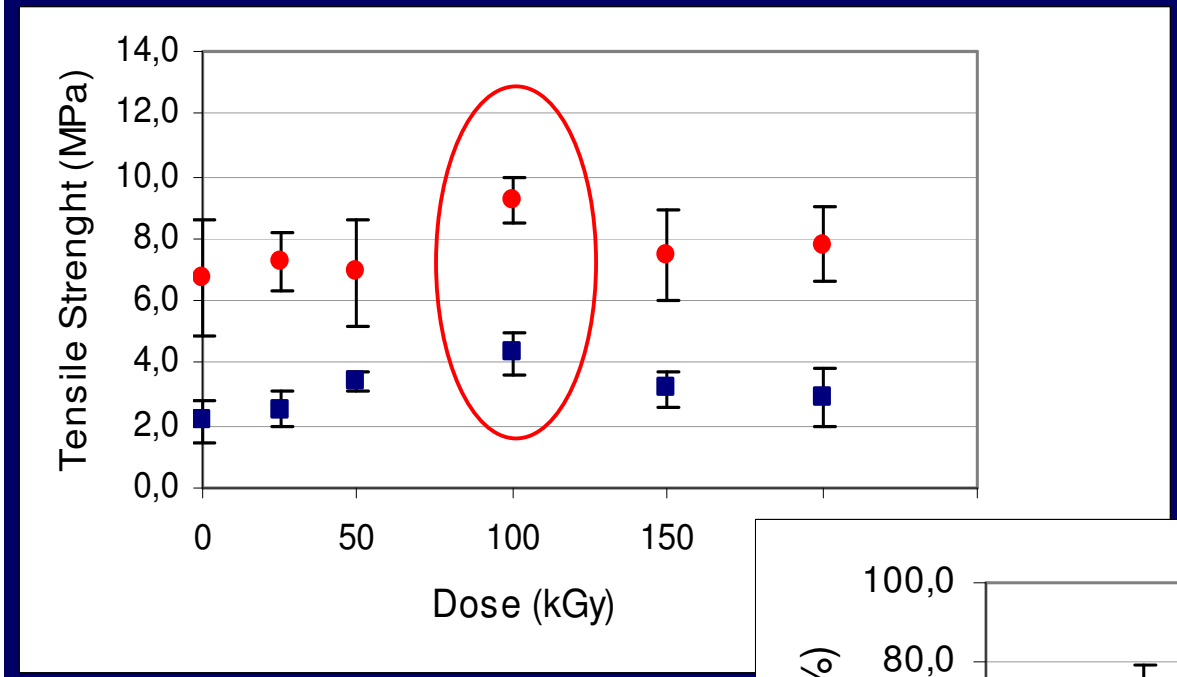
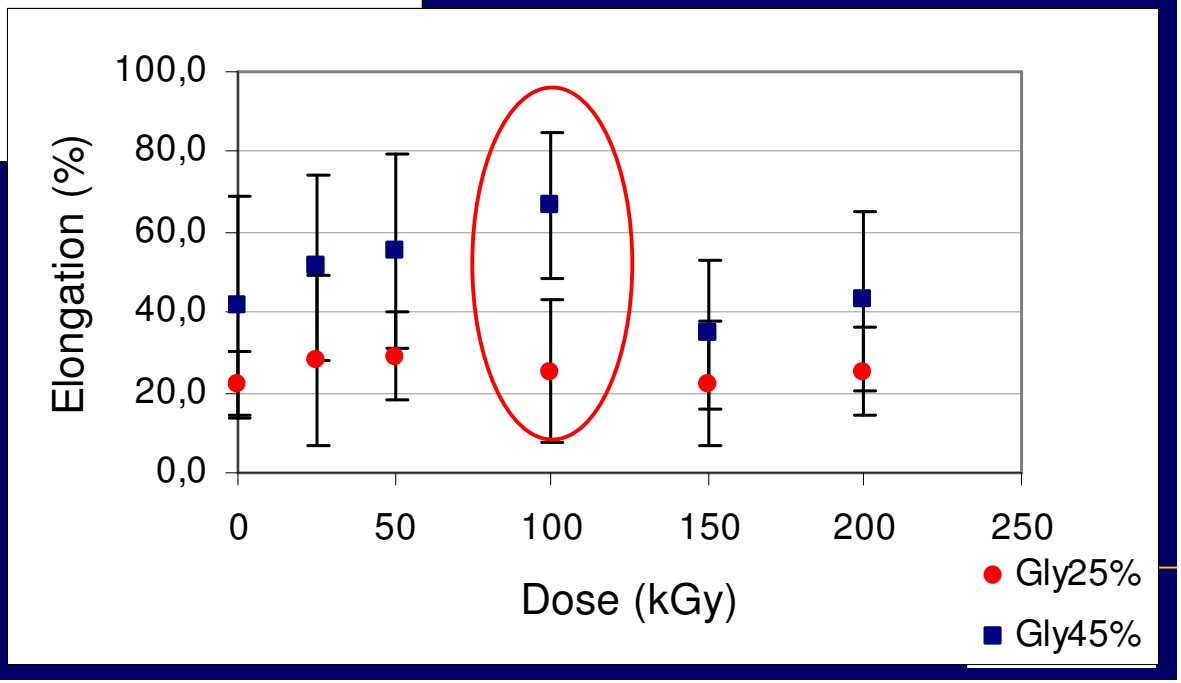
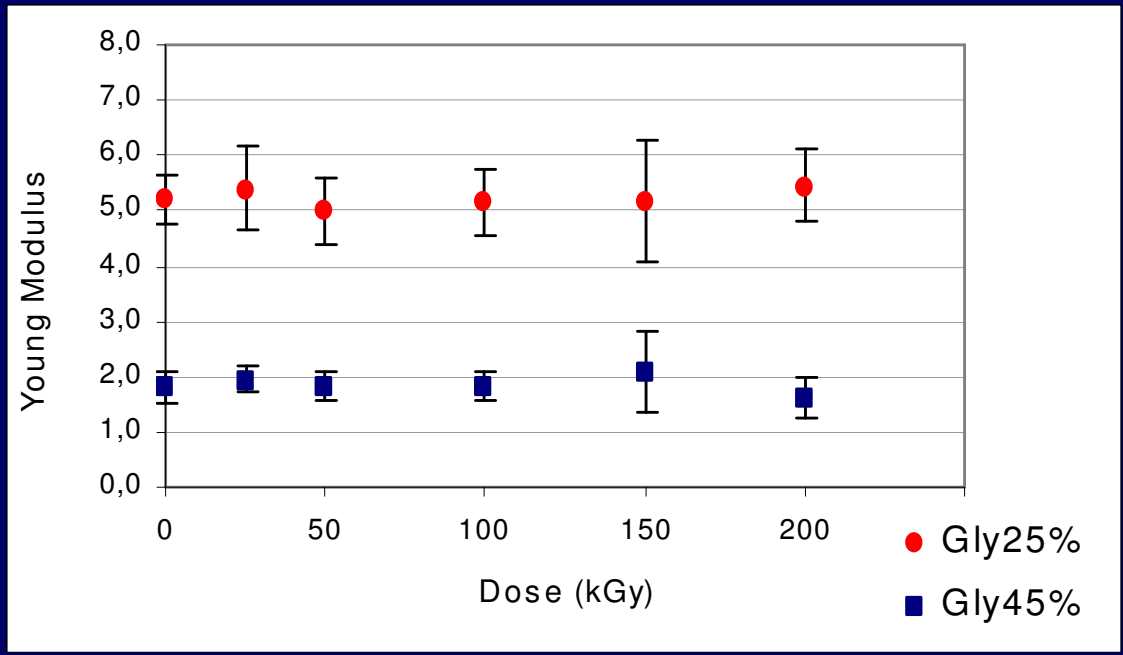
RESULTS





RESULTS

YOUNG MODULUS



Dose (kGy)	25% Glycerol	45% Glycerol
0	5.21 ± 0.46 a	1.81 ± 0.29 ab
25	5.40 ± 0.77 a	1.96 ± 0.25 ab
50	5.00 ± 0.60 a	1.83 ± 0.27 ab
100	5.17 ± 0.61 a	1.82 ± 0.26 ab
150	5.17 ± 1.11 a	2.08 ± 0.73 b
200	5.45 ± 0.65 a	1.62 ± 0.35 a

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CONCLUSION

Radiation from electron beam on films based on myofibril protein caused an slightly increase on tensile strength value in an absorbed dose of 100kGy, while elongation value at this dose had no reduction, indicating that radiation contributed to a better resistant film.

Other properties studied like color, opacity and solubility seemed not be significantly affected by radiation.

ACKNOWLEDGEMENTS

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THANK YOU !

HVALLA !