Faculty of Electrical Engineering and Information Technologies – FEEIT
Skopje, Republic of Macedonia

Establishing Laboratory for Detection of Irradiated Food in Republic of Macedonia

Prof. Margarita Ginovska

International Symposium on Food Safety and Quality: Applications of Nuclear and Related Techniques
Vienna, 10-13 November, 2014

Faculty of Electrical Engineering and Information Technologies – FEEIT, Skopje, Macedonia

IAEA TC project –MAK 5007 (2012-2014)

"ASSESING AND ENABLING THE IMPLEMENTATION OF FOOD IRRADIATION TECHNOLOGIES"

International Symposium on Food Safety and Quality: Applications of Nuclear and Related Techniques
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PROJECT PARTNERS

Coordinator - Faculty of Electrical Engineering and Information Technologies
Ss Cyril and Methodius University, Skopje

Faculty of Biotechnical Sciences - St Kliment Ohridski University, Bitola

GOVERNMENTAL INSTITUTIONS / NATIONAL INSPECTION BODYS

Food and Veterinary Agency

Radiation Safety Directorate

State Agriculture Inspectorate

IAEA International Atomic Energy Agency
Atoms For Peace

АГЕНЦИЈА ЗА ХРАНА И ВЕТЕРИНАРСТВО

International Symposium on Food Safety and Quality: Applications of Nuclear and Related Techniques
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PROJECT OUTCOMES

Status quo analysis	• Information for annual production and export of food and ag. com. • Needs for food irradiation as a sanitary, phytosanitary and food secruity measure • Harmonised food irradiation legislation
Human capacity building	• Scientific visits in food Irradiation facilities, nutritional aspects of irradiated food, detection of irradiated food, legislation • Networking project partners/stakeholders • Education & research
Protocol for Food Irradiation	• Data collection and analysis • Selection of irradiation technique • Protocol for e-Beam Irradiation Facility
Equipment for detection of irradiated food	• Photo stimulated Luminescence (PSL) • Thermo Luminescence/ Optical Stimulated Luminescence (TL/OSL

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PROJECT ACTIVITIES - SCIENTIFIC VISITS

Aériiall - Centre de RessourcesTechnologiques,Strasbourg, France

Szent Istvan University,Hungary

Texas A&M University, USA

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PROJECT ACTIVITIES

1. Networking with partner institutions

2. Education - two master thesis in the frame of the project have been completed.

3. Legislation – new provisions for food irradiated by ionizing radiation have been adopted in the beginning of this year ("Official Gazette of Republic of Macedonia")

4. Purchasing of equipment: PSL Luminescence; Thermoluminescence (TL/OSL)

5. Establishing a Laboratory for detection of irradiated food

6. IAEA Workshop – "Food Irradiation Technologies", 25 March, 2014, FEEIT, Skopje. Lecturer: Mr. Yves Henon, IAEA expert. Participants: arr. 40 (academy, governmental agencies and bodies, food processing and pharmaceutical companies…)

FOCUS → CONTROL AND DETECTION OF IRRADIATED FOOD

- Analytical detection of irradiation processing of food is very important to implement quality control at all levels.
- An ideal detection method should measure a specific radiation effect which is proportional to the dose.
- It should not be affected by processing parameters and storage conditions, or the length of time between irradiation processing and analysis.

- **Physical methods:**

➢Luminescence techniques: Thermoluminescence – TL; Photoluminescence – PL – screening method; Chemoluminiscenece – CL

➢Electron spin resonance spectroscopy (ESR).

- **Chemical Methods :**

➢ Detection of irradiated food containing fat - Gaschromatographic / Mass spectrometric analysis of 2-alkycyclobutanones;

➢ Detection of Irradiated food containing fat - GC - analysis of hydrocarbons

- **Biological Screening Methods**

➢ Detection of irradiated food using Direct Epifluorescent Filter Technique/Aerobic Plate Count (DEFT/APC) -Screening method

➢ Microbiological screening for irradiated food using LAL/GNB procedures

PHYSICAL METHODS : LUMINESCENCE

- EN 1788:2001, Foodstuffs - Thermoluminescence detection of irradiated food from which silicate materials can be isolated
- EN 13751:2002, Detection of irradiated food by pulsed Photostimulated Luminescence - screening method.

Basis: release by heating (TL) or pulsed infra-red light (PSL) of trapped energy in dry crystalline materials.
Suitable materials: silicate minerals and soils; absorbed or sands
Equipment: TL or PSL

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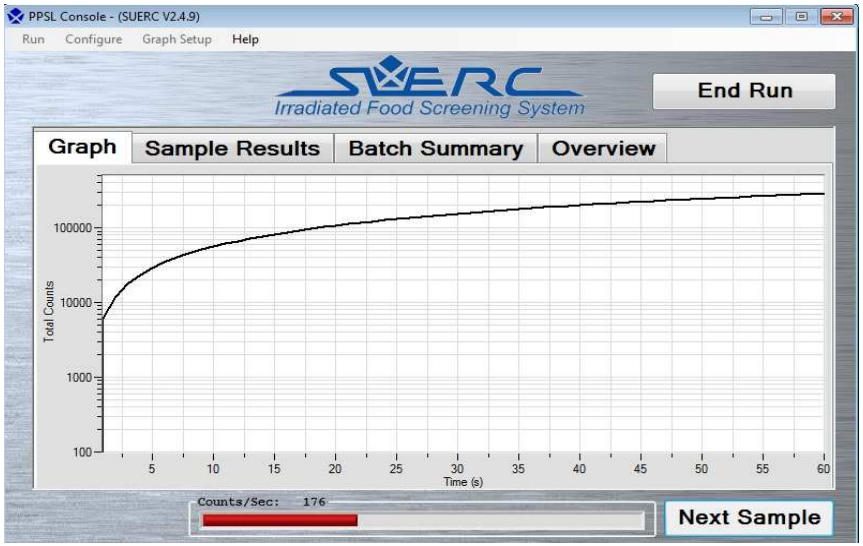
PHOTO STIMULATED LUMINESCENCE - PSL

Application of the procedure (EN 13751:2002)

Screening method

Calibrated method

The instrument is supported with a software for computer measurements using program SUERC PPSL



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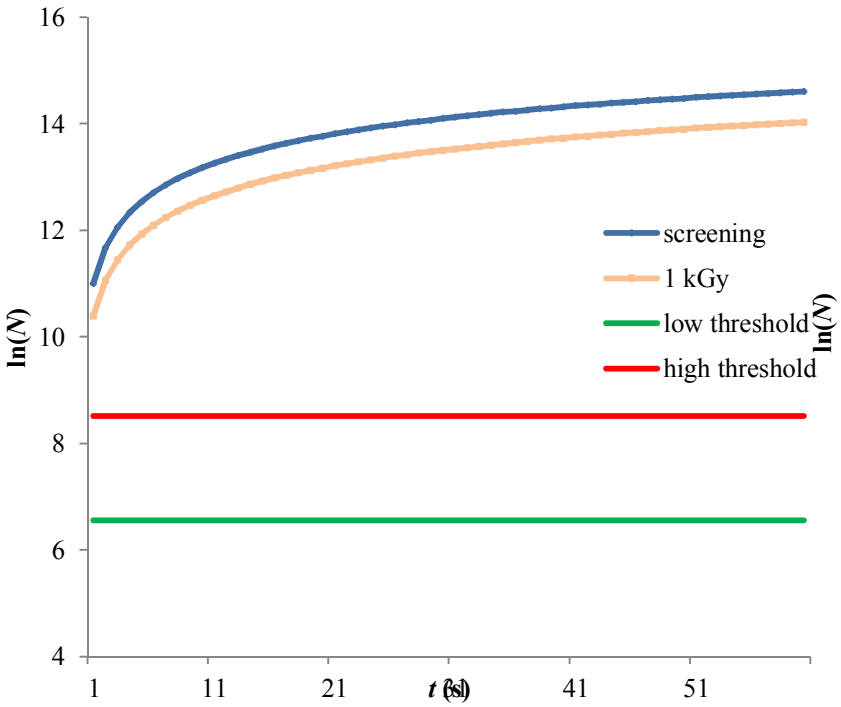
MEASUREMENTS

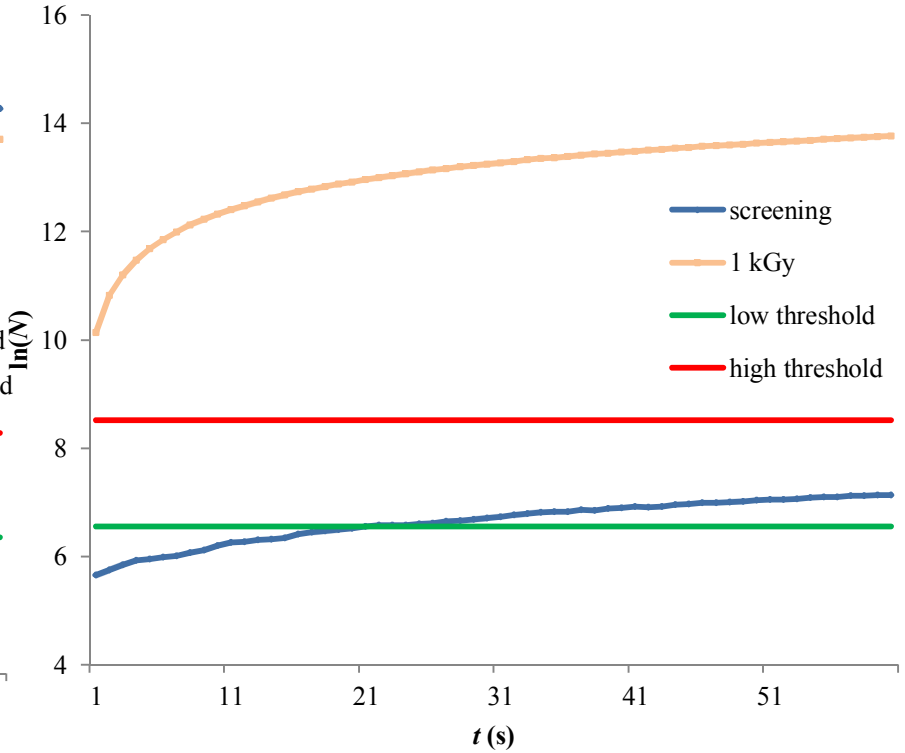
- Samples certified from Scottish Universities Environmental Research Centre, unirradiated and irradiated (Isotron plc, Moray Road, Elgin Industrial Estate, Wiltshire SN2 8XS in March 2013 with a dose of 8,4 kGy).
- Samples of different herbs and spices from Macedonia.
- All samples are tested with screening and calibrated method
- Irradiation: Co-60 with a dose of 1 kGy, 5 kGy и 10 kGy (Institute of Nuclear Sciences in Vinca, Serbia)

EXPERIMENTAL RESULTS

Irradiated paprika standard

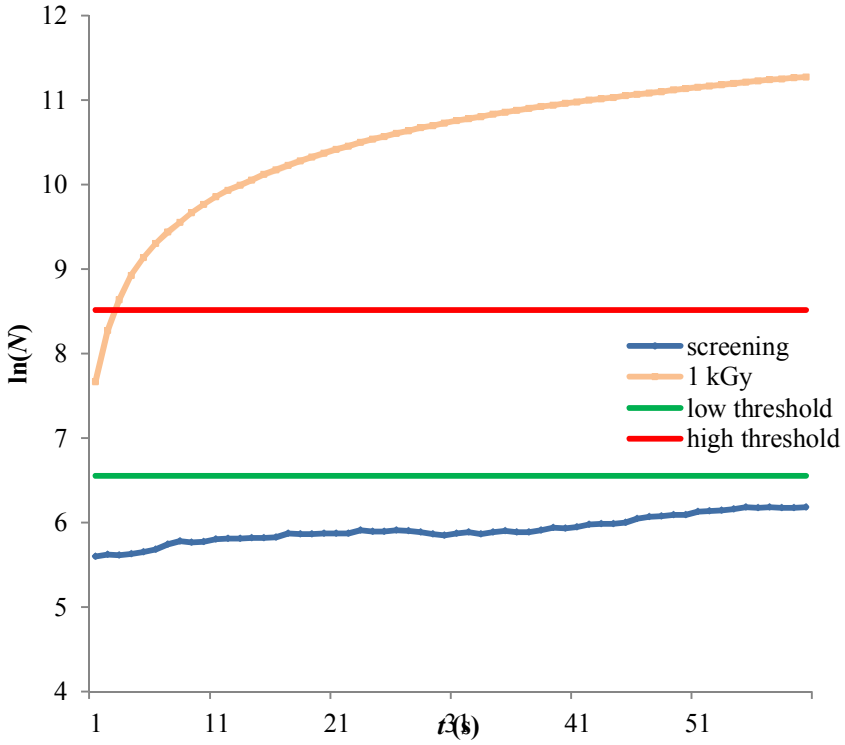


Unirradiated paprika standard

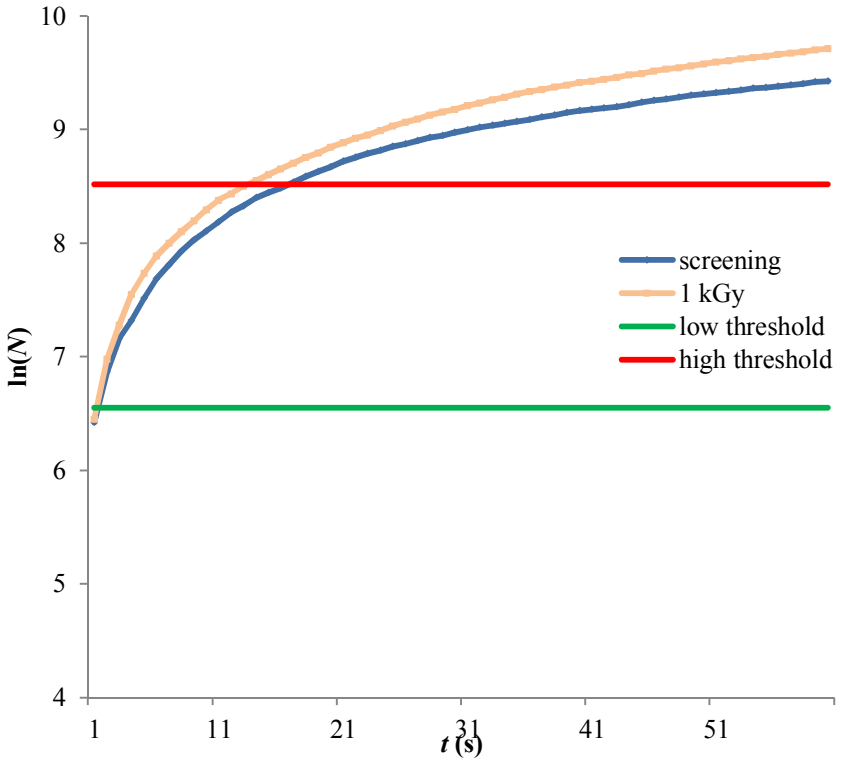


EXPERIMENTAL RESULTS

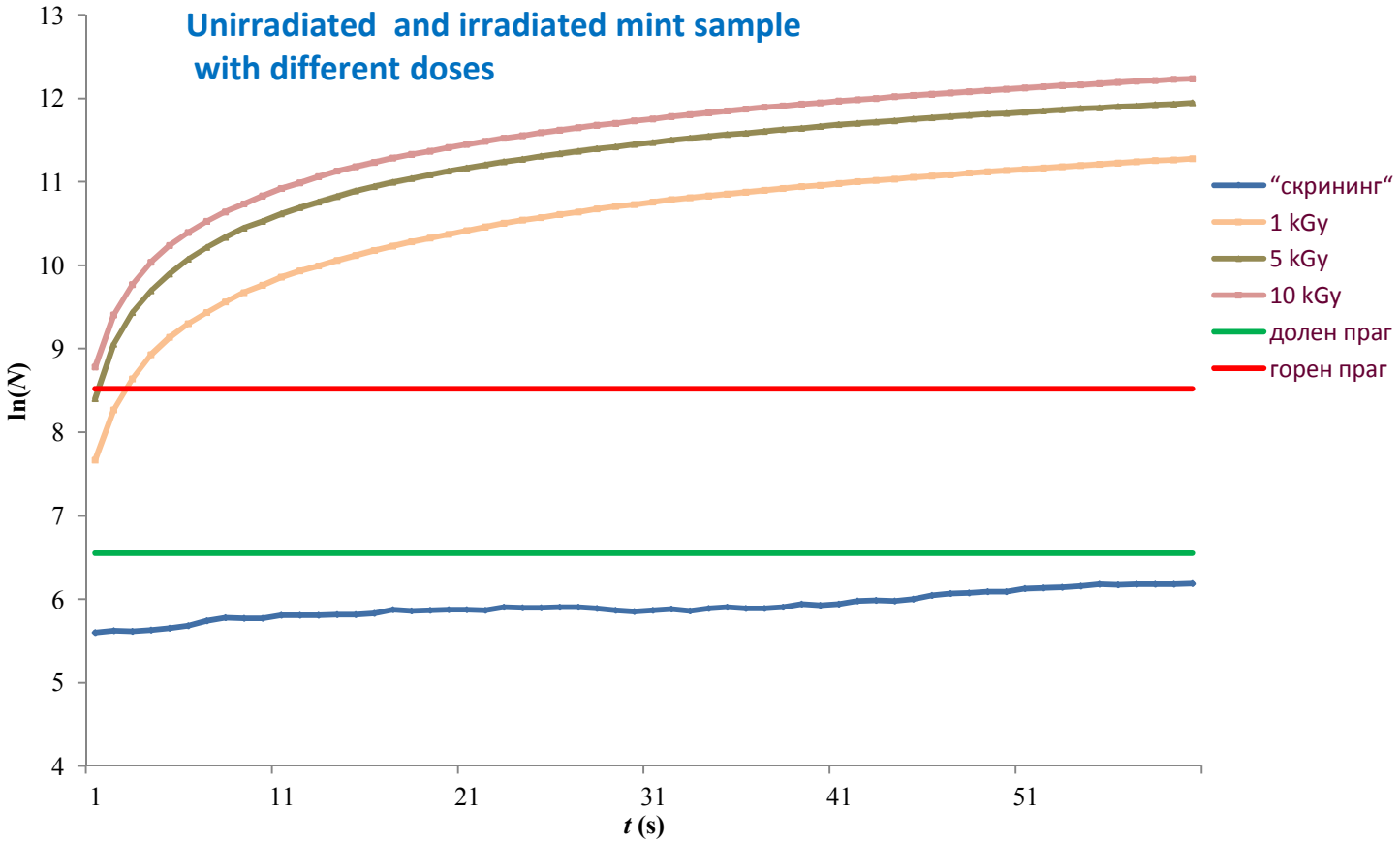
Unirradiated mint sample



Irradiated guarana sample



EXPERIMENTAL RESULTS



CONCLUSION - OBSTACLES

- Implementation of legislation procedures and provisions for food irradiated by ionizing radiation in practice is not sufficient.
- A collaboration between the Laboratory for detection of irradiated food and relevant inspection bodies and food agencies has to be arranged (contracts)
- Lack of knowledge and experience in control of irradiated food in Inspection bodies.

CONCLUSION - FUTURE PERSPECTIVE

- **Procedure** for thermoluminescence (TL) detection method has to be implemented.
- **Knowledge** in control and detection of irradiated food has to be improved (short and long term trainings, scientific visits, workshops and symposiums)
- **Proper control** of imported and exported irradiated food has to be perform continuously, in aim to enhance consumer confidence and safety.
- **Problem with unlabelled** irradiated foods has to be overcome by regulatory bodies.
- **Promotion and education** about the use of irradiation in food production has to be made, to reconcile the polarized opinions.

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THANK YOU FOR YOUR ATTENTION!

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