nanoBalkan – WEBINAR

Green Nanotechnology & Gamma Irradiation for Food Safety and Environmental Applications: Biosynthesis of Nanomaterials Using Plant Extracts

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Green nanotechnology is emerging as an eco-friendly and sustainable route for the development of nanomaterials intended for food, medical and environmental applications. In contrast to conventional chemical methods, which often rely on toxic solvents and reducing agents, plant extracts provide a natural source of polyphenols, flavonoids and organic compounds that can act simultaneously as bioreducing and stabilizing agents during nanoparticle formation. This approach enables the production of metal-based nanostructures under mild conditions, with reduced environmental impact and improved biocompatibility. When combined with gamma irradiation, biosynthesis gains further advantages: the process becomes sterile, more controlled, and does not require elevated temperatures or hazardous chemicals. Gamma irradiation enhances the reducing and stabilizing capacity of plant extracts, resulting in more controlled nanoparticle formation with improved size distribution and long-term stability. Biosynthesized nanomaterials exhibit strong antimicrobial, antifungal and antiviral activity, as well as photocatalytic and adsorptive capabilities. Therefore, they hold significant promise for:

- Water purification and wastewater treatment, including removal of pathogens, organic pollutants, pesticides and heavy metals
- Antibacterial and antifouling surfaces in food processing environments to prevent biofilm formation
- Active food packaging, where nanomaterials incorporated into films can extend product shelf-life, reduce oxidation and inhibit microbial growth
- Photocatalytic degradation of toxic industrial compounds under UV or visible light

This webinar will cover the principles of green nanoparticle synthesis, how gamma irradiation enhances the reducing and stabilizing capacity of plant extracts, and the analytical techniques used to verify nanoparticle size, structure and stability. Moreover, the presentation will outline research pathways where green nanotechnology can support food safety, environmental protection and the development of innovative solutions within our scientific community.

Opportunities for collaboration with regional laboratories will also be discussed, especially for advanced nanoparticle characterization and scale-up for industrial or pilot-level applications.

Wednesday, 26 November 2025 – 16:00 → meet.google.com/wzy-brme-xkz

Hosted by: Prof. Dr. Kledi Xhaxhiu