Summary of FNCA Open Seminar 2016

"Application of Radiation Technology and Sustainable Development in Asia"

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Vietnam Atomic Energy Institute (VINATOM)

Hanoi, Vietnam

Application of Plant Growth Promoters for Sustainable Agriculture (Dr Nguyen Quoc Hien, VINAGAMMA Center, VINATOM, Vietnam)

Concept of sustainable development and sustainable agriculture is introduced. Mode of biostimulant action of oligosaccharides as elicitor and growth promoter for plant is briefly described. Effect of plant growth promotion of oligosaccharides typically oligoalginate, oligochiotsan, oligocarraginan, oligo-β-glucan for rice, sugarcane, carrot, chili, lettuce, okra, soybean, tea, coffee, etc. is presented. Beside the plant growth promotion effect, the content of bioactive substances such as curcumin in turmeric, isoflavone in soybean seed, artemisinin in Artemisia annua L., is remarkably increased by the treatment of oligosaccharides as well. Trend in organic farming in the world and in Asian countries is briefly informed. Application of oligosaccharides as plant growth promoter for sustainable agriculture should be worthy of priority.

New Application of Super Water Absorbents in Japan (Dr Mitsumasa Taguchi, Quantum and Radiological Science and Technology (QST), Japan)

In recent years, the radiation therapy techniques have progressed remarkably. In the advanced therapy such as intensity modulated radiotherapy, effective doses are delivered to a cancer tissue while preserving a surrounding normal tissue. Dosimeters based on tissue-equivalent materials are drawing much attention as a useful tool for measuring a three-dimensional dose distribution. Gel dosimeter was developed by the radiation crosslinking technique for an evaluation of radiation dose for the precise cancer treatment. The gel dosimeter consists of radiation crosslinked hydroxypropyl cellulose hydrogel, super water absorbent, and less toxic reagents such as methacrylate monomers (2-hydroxyethyl methacrylate and polyethylene glycol dimethacrylate) and an antioxidant (tetrakis(hydroxymethyl)phosphonium chloride). The gel dosimeter became turbid after the irradiation of □-rays and X-rays, C ions. The turbidity was confirmed by visual observation, and analyzed quantitatively by using a UV-Vis spectrophotometer and also PC scanner. The gel dosimeter showed an increment in a degree of turbidity with the dose up to 10 Gy. Dose sensitivity of the gel dosimeter was adjusted by changing the composition ratio of the monomers. Two- and three-dimensional dose distributions

for the radiation therapy were evaluated by using the developed gel dosimeter.

Challenge of Electron Accelerator for Sustainable Development in the Philippines (Mr Fernando Aurigue, Philippines Nuclear Research Institute (PNRI), the Philippines)

During the time when the Philippine Nuclear Research Institute (PNRI) does not have yet an Electron Beam Accelerator, the Cobalt-60 Multi-purpose Irradiation Facility operates 24/7 to serve only a fraction of potential clients. It also happened that a large volume of carrageenan PGP should be produced for immediate use by farmers after five months' time. Thus, the promotion of irradiation services was lessened as there was no more capacity left to serve new or prospective clients; and unserved clients have no option but to resort to alternative means of sterilization which may be obsolete, costly, and could compromise the shelf-life and commercial acceptability of their products.

When the Electron Beam Facility was established at PNRI, the process flow for irradiation by E-beam was established and a Liquid Handling System was installed under a Department of Science and Technology – Grants In Aid project in order to utilize the new electron beam machine (2.5 MeV, 100 kW) for radiation processing of kappa-carrageenan solution into PGP. Now, around 1,700 L of PGP can be produced per hour.

From then on, PNRI can accept more products for radiation processing from more clients with option now for gamma radiation or e-beam treatment depending on technical requirement, and more timely radiation processing of products under strict quality control and quality assurance standards for radiation processed products.

The challenges of Electron Beam Accelerator for Sustainable Development in the Philippines remain. These are: (1) insufficient awareness of stakeholders on the knowledge about the technology and its benefits; (2) negative public acceptance of the concept of radiation related treatments; and (3) absence of government laws and policies that would serve as driver of utilization uptake, such as 'national protocols for irradiation of non-food products,' and business incentives to investors.