

Radiation-Processed Materials from Natural Polymers for Agricultural Applications: Carrageenan PGP as Plant Food Supplement

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Radiation processing is one of the applications of radiation technology which involves exposing materials, such as natural polymers, to ionizing radiation, either gamma radiation or electron beam, to impart desirable effects. It is a clean and additive-free method for preparation of value-added novel materials based on renewable, non-toxic and biodegradable natural polymers. Among naturally-occurring polymers are the cellulose in plants and tree; chitin in the shells of shrimps, crabs and other crustaceans; agar, carrageenan and alginates in seaweed.

Advantages of Radiation Processing

- ☑ SAFE
- ☑ EFFECTIVE
- ☑ A RECOGNIZED ALTERNATIVE TO CONVENTIONAL METHODS

Under adequate conditions, natural polymers either undergo degradation or crosslinking upon interaction with ionizing radiation. Degradation involves the reduction of molecular weight of polymers. Radiation cross linking is a procedure whereby molecules are linked to one another by irradiating the material with high-energy electron beams or gamma rays.

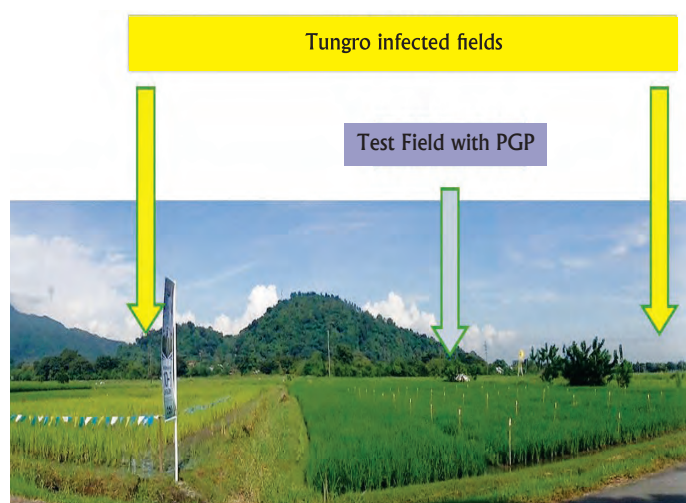
The Philippine Nuclear Research Institute (PNRI) has been conducting research and development studies on radiation processing of natural polymers (carrageenan, chitosan, cellulose) to develop these materials into useful products for health, agricultural and other applications.

AGRICULTURAL APPLICATIONS

Carrageenan PGP as Plant Food Supplement

Radiation-induced degradation of natural polymers is a promising application of ionizing radiation to develop natural bioactive agents. Polysaccharides, which are degraded by radiation, yield oligosaccharides (polymers with shorter chains). These oligosaccharides had been shown to have antibiotic, antioxidant and plant-growth promoting properties.

Plant growth promoters (PGPs) were developed by DOST – Philippine Nuclear Research Institute from radiation-processed natural polymers such as seaweed (carrageenan) and chitosan (shells of shrimps). The effects of these PGPs are being tested on rice, mungbean and peanut.



Field testing on rice sprayed with PGPs showed no signs of rice tungro bacilliform virus disease infection.

BENEFICIARIES

Farmers
Agri-based entrepreneurs
Seaweed industry

Mungbean plants sprayed with carrageenan PGP



Carrageenan is a polysaccharide extracted from red edible seaweeds. By radiation processing, carrageenan can be modified to be an effective plant growth promoter. Carrageenan PGP contains essential micro and macro nutrients which enhance the crop vigor of rice and other vegetative crops like pechay and mungbean. At even a very small amount, the PGP can increase the yield by 20-30 % for rice, 300-400% for mungbean and 40-60% for peanut.

The Carrageenan PGP has already been commercialized, and its production and distribution to farmers across the Philippines are already underway.

BENEFITS OF PVP CARRAGEENAN

- Compatible with farmers' practice on fertilizer application, thus, giving higher grain yield potential
- Promotes resistance to rice tungro virus and bacterial leaf blight
- Makes the rice stem stronger and improves rice resistance to lodging
- Environment – friendly natural product (has no harmful effect on natural enemies or beneficial insects and arthropods)