

FOOD PRESERVATION, MIRACLE BY RAYS

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(Signature tune-----Fades out)

Anchor: So friends here I am---your old friends, anchor for this episode of science radio serial "Golden Waves". In this episode we will remember prof A Sreenivasan, pioneer in food irradiation technology in India which is now benefiting millions of farmers, food trades and common men across the country as it prevents sprouting of onion, potato, delays ripening of mangoes, bananas and other fruits, disinfects meat, poultry and seafood and stabilizes food articles, so these may be kept fresh for longer periods even without refrigeration. Besides this, we will also have glimpses of principles and techniques of food conservation by irradiation. But before that, I have to look for Medha and prayas.....don't know where they are...

Scene-1

(Scene opening Music)

Place : Prayas's's house

(Prayas, Medha and their parents are sitting in their drawing room and watching television. News)

News readers: low ambient temperatures and high humidity from July, led to sprouting of onion and incurred loss to the farmers of Maharashtra, largest onion producing state not only in India but around the glob. More than 1.5 Lac ton of onion is stored every year in Nashik district only in conventional Chawls, our agricultural correspondent from Nashik reports. Most of the onion in chawls have sprouted. Sprouted onions shrivel faster owing to increased water loss by transpiration. Government has announced ex-gratia relief to affected farmers of the state.....

(News reader voice fades out)

Aakash : Same story every year...be it onions, potatoes, ripe fruits or other perishable food items.

Vashudha: Aakash in my kitchen, a good amount of food items rot or destroyed every week, good enough to feed a family of four for at last 2 days.

Aakash : You know Vasudha, after green revolution India produces over 160 Million tones of food grains every year, our of which upto 20 to 50 percent is spoiled due to various reasons...

Vasudha : Aakash, it may worth thousands of crores of rupees, that too when Thousands of people are not getting two square meals every day. Farmers and food Traders should be more careful because, ultimately it affects the food price .

Prayas: No ma, I think it is not always due to carelessness on the part of farmers.

Vasudha: Why Prayas?

Prayas: Sometimes, it is inevitable, that why few food items are called perishable such as onion, potatoes, ripe fruits and to an extent cereals and pulses too.

Aakash: Prayas is right Vasudha, how long you can keep a ripe mango in your refrigerator? Farmers have to send their produce to distant places to sell. Everything cannot be transported in refrigerated containers, after all it involves a lot of money.

Medha: Farmers need to store their produce for their future use. Prayas...howsoever vigilant they are...insects, worms, do develop in these, onions and potatoes sprout which sometimes causes a crisis of food items.

Aakash: ...and this sometimes cause price hike, black marketing of these food items Medha.

Prayas: Medha, hot and humid climate of India is quite favorable for the growth of numerous microorganisms that destroy stored crops and cause spoilage of food items.

Aakash: Not only this, spoilage can also occur due to chemical and physiological changes in stored food items, which is absolutely beyond human control.

Vasudha: Aakash is there any answer to it...?

Aakash: Vasudha, upto an extent no, because usually these losses can only be prevented by processes like cold storage, fumigation drying but usually not possible on mass scale.
(Sound of Footsteps)
(Dr. Sant, Director of food processing unit, enters)

Sant: (Clapping)...no...no...my dear sirs. There is a technique which is quite effective, cheap and possible on mass scale.

Medha : Oh Sant uncle?

Vasudha: Sant bhaiya, when have you come...so early.

Sant: Vasudha Bhabhi...while passing from here, I found your door open. So I thought, there is a good chance of getting a cup of tea and a plate of your famous onion pakoras.

Vasudha: Of course Sant bhaiya...

Aakash: Provided it the onions in your kitchen are not sprouted or rotted, vasudha.

Vasudha: of course not...Aakash you know how perfect house wife, I am.
(Every one Laugh)
(Vasudha exits from the scene)

Aakash: Come Sant, take you seat.

Sant: I will Aakash, surely I will...

Medha: Sant uncle, we were discussing perishable food items and traditional techniques of its preservations....

Prayas : And Sant uncle you were taking about some cheap technique of food preservation... is not it?

Sant : Of course Mehda, I was taking about about use of radiation technology for food preservation.

Aakash: Radiations technology....!

Sant: Yes Aakash, radiation technology can complement and supplement existing technologies to ensure food security and safety.

Prayas: Is it better than fumigation, our good old, time tested way of preservation of food.

Sant: Of course Prayas, irradiation of food items provides and effective alternative to fumigation that is being phased out due is its adverse effect on environment and human health.

Aakash: A big claim Sant...

Sant: ...But true...Aakash. The story started with the commissioning and "Operation Cirus Atomic Reactor."

Medha: How Sant uncle?

Sant: The used fuel rods discharged from the reactor were stored in the water pool to prevent harmful radiation coming out of it.

Prayas: So Sant uncle...

Sant: So Prayas it was thought that can this residuals radiation be used for preservation of food items.

Medha: Then Sant uncle.

Sant: Medha, in 1967 India received a gift from Atomic Energy of CANADA Limited as a token of friendship from Dr. Bhabha's rowing teammate at Cambridge Dr. W.B. Lewis, who later became the chairman of Canadian atomic energy programme.

Aakash : ...Great...what was it?

Sant: It was food package irradiator. It was installed at food irradiation processing laboratory, Trombay and used fuel rods from CIRUS reactor.

Prayas: So the journey began in 1967? Sant uncle?

Sant: Yes Prayas and the flag bearer was professor A. Sreenivasan who led the food science group.

Medha: After that Sant uncle?

Sant: Medha, professor Sreenivasan started radiation processing on wheat and potato.

Aakash: Two important crops which mean a lot.

Sant: Yes Aakash, later some other agencies like Bhabha atomic research centre, National institute of nutrition, Indian council of medical research, joined hand together in this ambitious project.

Prayas: They have to be, because it was the need of hour.

Sant: Year Prayas, after testing and retesting by various agencies, it was found that radiation processing of food items does not pose any adverse impact on human health.

Aakash: But there should be some losses of nutritional elements especially vitamins.

Sant: Quite insignificant Aakash. In comparison to other food processing and preservation methods, the irradiation has least effect on the main nutrients such as proteins, carbohydrates, fats, minerals and vitamins.

Medha: Sant uncle, is there any chance of contaminations of food items by radioactive substance?

Sant: Absolutely not Medha, because not at any step food items come in contact with radioactive material.

Prayas: Later some other units might had been installed to make technology available to common men, formers and food traders.

Sant: Yes Prayas, yes...more units were installed, one at Vashi Navi Mumbai, in the year 2000 for medium and high dose applications, for commodities like spices and dehydrated onions, with a capacity of 30 tones per day.

Aakash: You too are in a food processing facility, is not it Sant?

Sant : Yes Aakash it was the second one, installed in July 2003 at Lasalgaon district Nashik in Maharashtra.

Medha: What do you process here, Sant uncle?

Sant: This is low dose irradiation facility which processes onion, cereals, pulses and cut flowers too, with capacity of 10 tones per day.

Prayas: Sant uncle once you said medium and high dose application and in next breath you told us low dose application...what does it means, really.

Sant: Oh, it means the intensity of radiations used for food processing-Low dose means less than one kilogray.

Prayas: ... and medium dose application?

Sant : When radiation of 1 to 10 kilogray is used for food irradiation, it is called medium dose application.

Aakash: It means more than 10 kilogray is used for high dose applications.

Sant: Yes Aakash

Medha: Sant uncle, what do you mean by Gray.

Sant: Medha, Gray is a unit of absorbed radiation and is equivalent to 1 joule per kilogram.

Prayas: But, I think unit for radioactive energy is "rad"

Sant: Of course Prayas, but it is an old unit for that purpose, newer unit is Gray which is equivalent to 100"rad".

Medha: Sant uncle, why this division of radiation doses...some specific objective

Sant: Yes Medha, dose of radiation depend on what you want to do with the food item.

Medha: I dont understood.

Sant: Let me explain. Low dose radiation dose is needed to inhibit sprouting in potato and onion, insect disinfestations in stored grains and pulses and destruction of parasites in meat and meat products.

Medha: Oho... and medium dose of radiation...

Sant: It is used to kill bacteria in fresh fruits, meat and poultry, spices and herbs etc.

Prayas: ... and sant uncle when high doses of radiation are used.

Sant: Prayas, it is reserved for special food processing.

Medha: Special food processing...?

Sant: Yes Medha, by this, food items can be kept for longer periods, even without refrigeration.

Sager: very useful indeed?

Sant: Yes Aakash, thats why more than 100 countries have approved irradiation process for more than 100 food commodities to be processed using this method.

Prayas: Sant uncle, it should be costly process isn't it?

Sant: Not at all Prayas, not so costly. Irradiation costs may range from 25 to 50 paisa per kilo for a low dose application inhibition of potato and onion sprouting and for killing insects in cereals and pulses.

Aakash: This too can be brought down in a multipurpose facility, treating a variety of product around the year.

Prayas: ...and These treated food items will be easily accepted in international markets. Who are more conscious about hygiene of food products.

Medha: How this process really works, sant uncle?

Sant: Medha, irradiation processing of food involves the controlled applications of energy from ionizing radiation such as gamma rays, electrons and x rays for food pereservation.

Aakash: I think these radiations come from used fuel rods of reactors.

Sant: Not always Aakash. Cobalt-60 and caesium-137 are usually used as radiation sources.

Prayas: ... and radiation emitted from these do the job, sant uncle.

Sant: Yes, Prayas. These are mainly Gamma rays which penetrate deep into the food materials and bring about the desired effects.

Medha: But Sant uncle, how this really happens...I mean the processing in the plant...?

Sant: Oh, so Medha you want to see processing plant...very clever...

Medha: Obviously...

Prayas: Is it really possible, sant uncle?

Sant: If you desire so Prayas, because, I am working in one such facility here.
Medha: Oh...its wonderful...
Prayas: Then when we can visit it.
Sant: Anyday Prayas...
Prayas: Tomorrow?
Sant: Well...O.K.

(Scene closing music)

Scene 2

Place: food processing plant (give desired sound effects)

(Medha, Prayas and Aakash have reached in the plant)

(scene opening music)

Medha: So we reached, Krishi Utpadan Sanrakshan Kendra...

Prayas: Yes Medha, but where is sant uncle?

(footstep noise)

Sant: I am here Medha...

Medha and Prayas: (Simultaneously) Good morning Sant uncle.

Sant: Very Good Morning Medha, Morning Prayas of Aakash you too have come.

Aakash: Of course as a driver to the kids.

(everyone laugh)

Sant: I was waiting for you, should we move to processing plant.

Medha and Prayas (simultaneously): why not?

(scene closing music)

Scene-3

Sant: Medha...Prayas come here, first of all, look at this line diagram. It will explain you many things.

(foot steps)

Prayas: In the centre where this "S" is written...this 'S' stands for?

Sant: This "S" stands for source Prayas.

Aakash: It means radioactive material is placed here, Sant.

Sant: Yes Aakash, radioactive material is placed here and food items are placed around it on a platform which revolve around it.

Medha: Why Sant uncle?

Sant: So that it can be exposed to radiation from every side.

Medha: oh...

Sant: So..should we move to processing unit itself.

Prayas: Sant uncle, is it safe to go near the processing unit...I mean any radiation hazard...?

Sant: Oh no...for two reasons, Prayas.

Medha: Two reasons?

Sant: Yes...first irradiation chamber is shielded by 1.5 to 1.8 meter thick concrete wall which prevents radiation from reaching the work area and operator room.

Aakash: ...and second reason?

Sant: Aakash, secondly when facility not in use, the radiation source is stored under 6 meter deep water.

Medha: why under 6 meter deep water?

Sant: Medha water shield does not allow radiation to escape into irradiation chamber, thus permitting free access to plant personnel to carry out plant maintenance.

Medha: Vow...very safe. Then lets move.

Sant: Yes come Prayas...you too Aakash.

(foot step noise)

(scene closing music)

Scene 4

Place: Operator's room.

(Medha, Prayas, Aakash and Sant enter the operator's room)

Sant: Medha, this is operator's room. Every function of this plant is automatic.

Prayas: Can we see it functioning?

Sant: Yes...fortunately irradiation process is about to begin..so watch on this monitor.

(desired effects)

Medha: It looks like a small pond...

Prayas: Medha, look there is some movement in the water surface.

Sant: Prayas, this waterbody is the place where charge or radioactive material is stored, deep under the water.

Prayas: It looks like a container, papa.

Aakash: Probably this contains radioactive material, Sant?

Sant: Yes Aakash when this platform reaches its final position, then walls of container slide open so as to expose the charge.

Medha: Look Prayas, this is happening.

Prayas: Sant uncle, what is kept on this conveyer belt, Sant uncle?

Sant: Prayas, food pre-packet in bulk in to---- box and other containers, which let the radiation pass through it, is placed on this conveyer belt.

Sager: ...and this will go to irradiation chamber.

Sant: Yes Aakash, the conveyer belt goes through a concrete wall labyrinth into the irradiation chamber.

Medha: Look Prayas conveyer transported the containers on the platform around the charge.

Prayas: Yes now the outer platform too has start revolving.

Medha: Containers are also revolving on their own axis.

Sant: Yes Medha, so the contents of the containers are irradiated on very side.

Medha: Sant uncle revolving platform is stopped now.

Sant: Yes now the dosimeter reading will start.

Prayas: Dosimeter reading...?

Sant: Yes, dosimeter is an electronic devise. It detects, how much radiation which are keep inside every container is absorbed by the food item. Once it is found satisfactory, process of irradiation is supposed to be complete.

Medha: Look Prayas container are again loaded on the conveyer belt.

Sant : Yes Medha, process is finished.

Medha : It is wonderful, Sant uncle.

Sant: Yes Medha, food irradiation technology has unique merits over conventional methods of preservation, such as canning, dehydration, salting etc., as this does not lead to loss of flavour, odour, texture or freshness of food items.

Aakash: Unlike chemical fumigants, irradiation does not leave any harmful toxic residues in the food and, is more effective too.

Sant: Yes Aakash, its so easy and efficient, that it can be used to treat pre-packed commodities such as spices and size of package does not effect the efficiency of treatment.

Medha: ...and for this we are thankful to its flagbearer in India, Prof. A. Sreenivasan.

Sant: Yes and many other scientists like him.

Prayas: Sant uncle I would like to be a scientist when, I grow up...

Medha: ...I too... and will bring laurels for my country.

Prayas: I would like to be scientist like Prof. Sreenivasan.

Sant: May God bless you children.

(scene closing music)

Anchor: So friends today we have listened about Prof. A. Sreenivasan, flagbearer of food irradiation in India, and about the process too. In the next episode of this science radio serial we will talk about...