Nanotechnology in Agriculture
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Lecture-34
Nanomaterials in food processing and preservation-I

Welcome back to the lecture series in application of nanotechnology in agriculture. So, we have kind of browse through the applications of nanomaterials in animal production. So today we will be moving into another aspect of utilization of nanomaterial, there is food security in terms of food preservation, food processing, food packaging. So ok let me see the topic and then we will kind of get an overview of basically what will be doing is now nanotechnology applications for food preservation.

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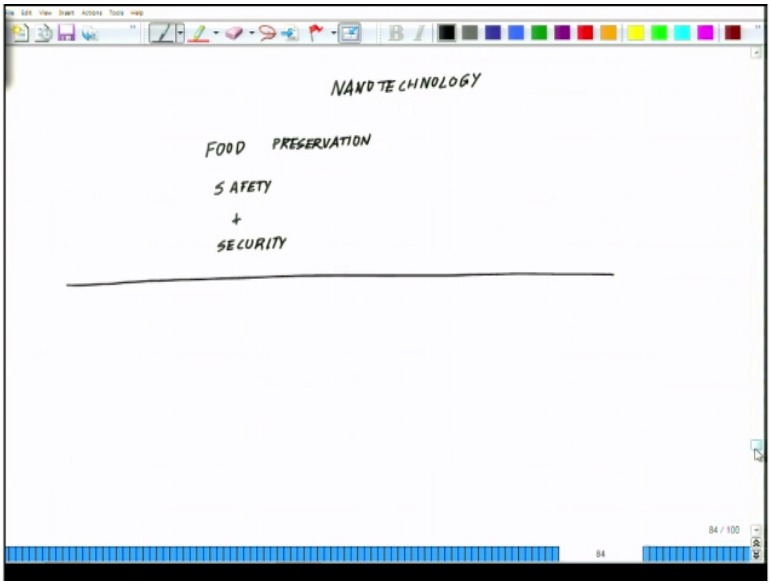

One of the critical aspect and why is it so we will talk about safety and security. So these are some of the very important aspects what we are going to dealt today. So, talking about food preservation, safety and security all of us are aware of the fact that suppose this is the season for oranges, but still we get processed product of orange in off season.

Since time and memorial mankind has learn the agriculture, it has made it a point during off season or during the lean production time it should be able to preserve, store, whether it is green, whether it is some other form of crops like you know legumes in terms of pulses even preserving

vegetables or processing those products into some other products like say for example jam, jellies, marmalades, sauces, sketch-ups.

So, food processing and preservation, these a pretty long story we talk about HR and all these things. These are nothing but you are transforming the product into another form which will last for a prolong period of time of course everything has a shelf life it need not be there forever. But this is how the since the onset of agriculture mankind has also develop from cottage, from mother's kitchen to a cottage to a big industry food preservation and safety remain a part of all learning.

Well when we talk about preserving food, so you have to use lot of preservatives, you have to use lot of different kind of compounds which will not allow fungal growth or when you are storing grains or storing pulses you have to ensure there is not infestation of insects or other pests, no microbial attack. So these are interlink phenomena, when you have to do so you have to use tons of chemicals they could be synthetic, they could be natural.

Say for example whenever we store things you must have seen people are must afford it from your grandma or mom that you know they put neem balls out there Azadirachta Indica ok which is the common practice in India. Some people put turmeric are healthy ok balls inside, they say they also repel the insects similarly some places in biggest store houses they use gamaxin.

In terms of processing people use acidic acid and transforming the marmalade jam they use lot of sugar to prevent any kind of microbial attack. So these are common these are not something out of the word thing they are day today wisdom which are pass from one generation and other. So, in these few classes will try to systematically study what are the steps involve where all nanotechnology can play a critical role.

In order to reduce waste of food, in order to preserve the food with least amount of natural or synthetic compound by going down to the nanomaterial zone. In other word you are just reducing the size in order to really you know achieve the goal and what all economical benefit

we derive out of it. So, let us move on and let us see some of the aspects of food preservation, safety and security, so one of the major thing.

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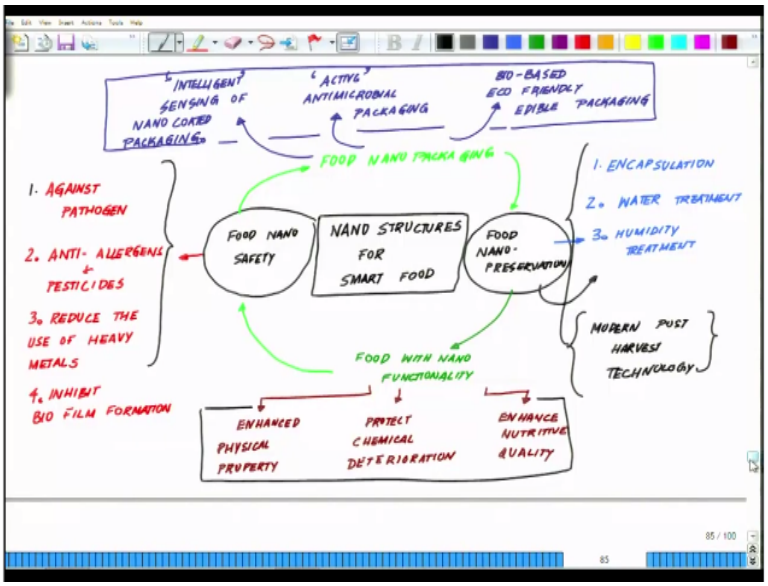

So, nano structures for smart food, nano in a flow chart form we will discuss this nano structures for smart food ok, in terms of that we will be talking about food nano preservation and food nano safety ok, these are the 2 aspects what we are going to dealt ok. Food nano preservation and food nano safety, so in terms of food nano safety what are the aspects which are being addressed currently in the research is against pathogen.

Against pathogen this is one of the major problem infestation of pest, second anti-allergens and pesticides. Third reduce heavy metal usage, reduce the use of heavy metals and the fourth aspect what is dealt is inhibit the formation of bio films. This is mostly the microbial attack ok, inhibit bio film formation. So if you look in the other side in terms of the food safety, so this is the food safety part and if you look at food preservation part.

In terms of food preservation the areas where major thrust are one is encapsulation, second is water treatment, humidity treatment, water treatment will be the next topic soon will be dealing, water treatment, humidity treatment ok. Now this food preservation will lead to food with nano functionality in terms of why we call them smart food, food with nano functionality and what are

those functionalities. They have enhanced with physical properties what is being decide of enhance physical property in terms of the shelf life of the food, protect chemical deterioration.

Similarly enhance nutritive quality, similarly in terms of food nano pathogen when you talk about these are all are interlinks circle food nano packaging. So these are some of the functionalities which are derived out of it, one is intelligent sensing of nano coated packaging, one of the areas active antimicrobial packaging and bio-based eco-friendly edible packaging.

So there could be many more of these but these are the key attributes what is expected of these kind of modifications by encapsulation water treatment, humidity treatment of the food ok. So what I wanted to highlight is that the whole food industry currently is kind of looking for these different aspects. If you look at the right hand side of it when you took to talk about the food nano preservation this area is the modern post-harvest technology ok.

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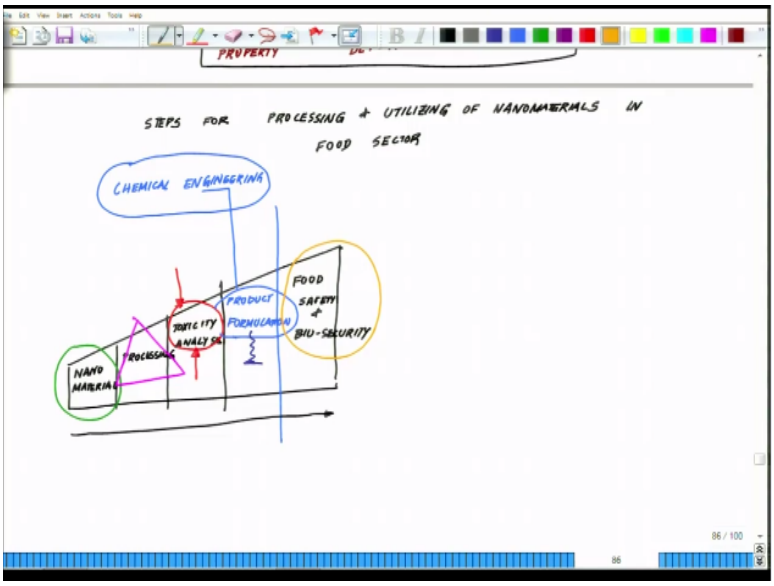

So, having said this what we will do is next we will move on to talk about the steps for processing and utilization of nanomaterials in food sectors. So the steps for processing and utilizing utilization of nanomaterials in food sector ok, so to start of it we talk about we have already talked about. So this is how the flow chart will grow up give you an idea nanomaterials desired nanomaterials ok, processing of nanomaterial.

We have already talked a lot about it during the course were toxicity analysis, this is the third step, this is pretty critical in terms of toxicity analysis one has to ensure that particular nanomaterial is not causing any harm to the consumer to the human. So say for example you are using some form of carbon which is human body is use to like carbons found in gripe water or carbon from in bio chart the meat or something.

So, it means the body is comfortable, so you can use those kind of carbon ok, so this is when you talk about the toxicity analysis. This is one critical step before any kind of food and drug organization is going to allow the product to come into nature, then the product formulation this is extremely important this part how you are going to deliver it product formulation. So this is a big big area of chemical engineering food chemical engineering ok and biochemical engineering.

The formulation in what form you are going to supply say for example when we talk about formulation. If you must have seen nasally sprays, you must have seen sprays for treating the plants, you have seen powder, you have seen you have these in the plug point from mosquito repellant you have these kind of liquid which you plug-in and the vapour comes out.

So, these are different forms of formulation, how you are formulating the product, so the way will be formulating the product will decide how the product will spread-out. So, for any kind of nanomaterials one has to ensure how you are formulating it, so that it could be used pretty efficiently okay. So next in the line is your food safety and bio security ok, so these are the initial steps and this chart will continue as will move through.

So, selection of the nanomaterial, how you are processing it, what kind of toxicity analysis is being done, what it is the product formulation you are using, then comes the critical one food safety and bio security. So I am closing here, in the next class we will continue from this chart where we have stop today, thank you.