Organic Farming for Sustainable Agricultural Production

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Lecture – 33
Quality of Organic Food

So, I welcome you to the lecture 33 that is Quality of Organic Food. We have discussed the earlier classes regarding the production practices of organics, how can make the organic inputs and field level productions and including nutrient managements, land management, plant protection measures, for the organic farming standards.

Last class we discussed about the transition to organic; that means the farmers, how they can convert from the conventional farming to organic farming, what are the steps involved and how you can smoothly convert your land from conventional to organic production.

So, the main objectives of having a organic farming or to convert land to organic farming is to have a better quality of the foods to increased productions. At the same time, we see there is less effect of this organic managements on the environments; that means, it ensures environmental sustainability food quality and the better food production.

So, as our aim or the say goal of organic farming to have a good quality of food, in addition to other benefits like, the environmental sustainability or the better productions. So, how it can compare the organic food with conventional food? And what do you mean by the food quality? How the organic food has superiority forgot the conventional food? Those things you we will discuss in this lecture.

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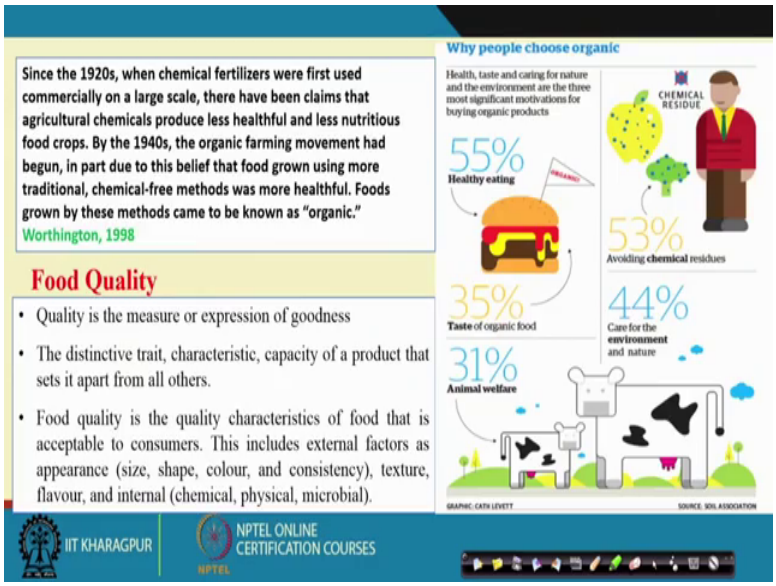

So, if you see the by Worthington 1998 what he has coated since the 1920's, when chemical fertilizer were first used commercially on a large scale.

There have been claims that agricultural chemical produce less healthful and less nutritious food crops. Later in 1940, the organic farming movement had bigger in part, due to this belief that food grown using more traditional chemical free methods was more helpful, the foods grown by this methods came to be known as a organic.

So, as we have discussed the earlier classes, how it can grained as organic, because foods are grown organic way; that means, without use of any synthetic chemicals or synthetic chemical fertilizers or the pesticides and those foods are branded as organic foods starting from 1921, there was a need then chemical fertilizer because they are realized also. Because that is a harmful or the bad the bad effect of adverse effect of the chemical farming on human health and then came the organic farming and where he believed that, there is a traditional way of growing crops the chemical free methods can provide the good food or the healthy foods.

Then in the right hand side if you can see why do people, choose organic foods because, see the health test and caring for nature so and the environments are the 3 most significant motivations for buying organic products. So, people want to be healthy foods and caring for the nature and the environments and the test of the foods. So, from this you can see appropriately 55 percent population, support that the organic foods there

they are consuming organic food, because of the healthy health for point of view healthy eating, healthy foods and 53 percent people, this also avoiding chemical residue.

The organic foods as very very less or no chemical residue to avoid chemical residue, that you can consume the organic foods 35 percent, they do the opinion of the taste of organic foods, 31 the 34 percent. They do have the opinion that care for the environments, to have a better environment better air to live and the better water the clean water drink. So, go for the organic there, 44 percent of the part the populations of the opinion and 34, 31 percent populations have the opinions of the animal welfare. So, this is why the people choose organic foods then, if you see the food quality.

What do you mean by food quality? The quality is the measure of or an expression of goodness, because if you compare of the foods quality, as you say the quality aspect the goodness; that means, the we have the strong belief or the say the good quality; that means, the expressions or the goodness of the foods, that is a good for what? You know the quality say the distinctive rate characteristic capacity of a product that sets it apart from others. So, you can differentiate from others by some measures that is the quality how can differentiate, one type of food from other type of food with some criteria, some characteristic or the trades as a capacity by which, we can differentiate.

So, one product from the other product so, that is of the product quality. So, as you see the food quality, the quality characteristics of food that is acceptable to consumers and this includes the external factors, how can see with good quality or the bad quality food. So, based on the external factors, that may be the size, colour, appearance of the foods or the consistency of the foods.

As you say the external factors, how can I, can differentiate from the 2 type of foods good quality or not quality not up to the mark; texture, flavour and the internal properties of the physical properties, chemical properties are the biological the microbial properties. Microbial contents on that way, we can differentiate between foods or among the foods then you can say the quality foods.

So, either the aggregation times the consumers, they get tempted, they have the eye appearance, the physical appearance of the foods that looks shining or the colour is good, appearance and size also good they do buy. So, they have the while buying they do have

the probably less concerned about the quality, the pay, the chemical properties nutritional quality of the foods.

Usually from the health point of view, we should concerned about the nutritional quality of the foods, contents of the foods, that from the organic foods though, they do not have the good size, they may not be get the good size or the shape may not be as of the chemical produced, but they have the nutritional quality, the chemical properties is much better, far better for from the human health point of view.

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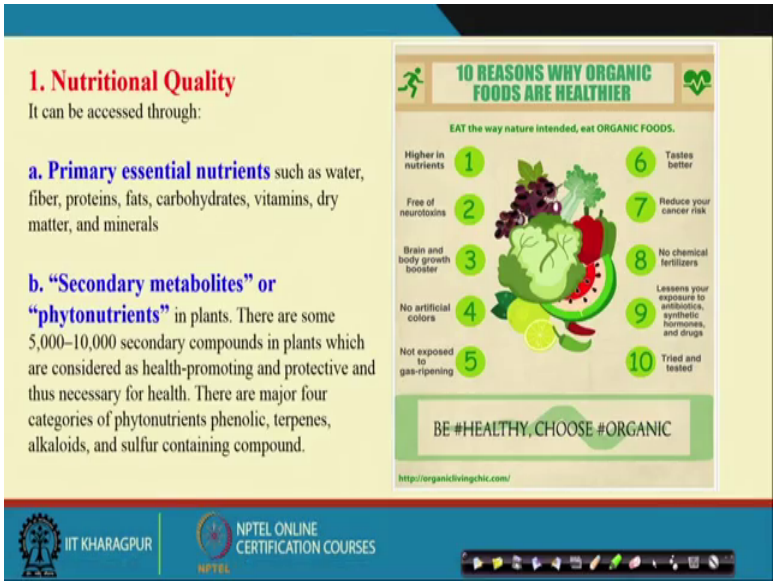

So, if you see the quality. So, as you say the 10 so, 10 reasons why organic foods are healthier? So, this is a one, this is higher in nutrients as we have discussing. So, usually people should prefer the buyers, because with the education. So, the literature, gives awareness that is among these consumers, we should go for the higher in nutrients or the nutritional quality or from healthy foods from health point of view. There should be higher in nutrients free of neurotoxins that is a less of chemical residues, brain and the body growth boosters.

No artificial colors not exposed to gas ripening, that is a no artificial ripening, natural ripening process say testing that is a better test as compared to the conventional foods. Reduce cancer risk, because it contains less of pesticides that minimizes the not only cancer risk, that many diseases crooning diseases avoided due to the organic foods, no chemical fertilizer of course less essential exposed to antibiotics, synthetics, hormones

and drugs, because this is free from any the growth hormones or the antibiotics and the of the other thing, that it is tested, proven. So, proven technology say proven technology is the best one.

So, the organic foods are proven are known, well known of the better quality as compared to conventional food. So, if you think of the quality, first discuss about the nutritional quality, how the organic foods are better as compared to the conventional foods? It may happen that not exactly the in way some researchers have seen organic foods and conventional food, if you see the quality there maybe up part there, may not be difference, but many research report have established that organic products are a better quality as compared to conventional products.

So, if this nutritional quality, it contents primary essential nutrients such as water fiber, proteins, fats, carbohydrates vitamins, say dry matter and minerals of the secondary metabolites or the phytonutrients as say, in plants there are around 5000 to 10000 secondary compounds in plants, which are considered as health promoting and protective and does necessary for health.

So, therefore, there are the major 4 categories of phytonutrients, phenolics, terpenes, alkaloids and sulfur containing compound. So, what you say here? If you think of the quality, the nutritional quality and secondary metabolites, the nutritional quality because these elements essential elements contents in the food products, as you see for enhancing, the growth and the bio mass of the crop yield, the crop that depends upon the contents of the essential elements in the soil as supply of the essential elements.

But if you see the secondary metabolites though, they are not essential for the growth and development of the crops, but having secondary the metabolites in the plants the production of secondary metabolites, they have the action against in many diseases in human body. They protect the human being from many diseases, if the crop if the food materials has higher content of secondary metabolites.

So, they have the function of having the defense mechanisms or they fight for many diseases in human body. So, that is why, the secondary metabolites is very important and the in many products having the higher secondary metabolites like the organic products are expected to have the higher content of secondary metabolites, because the organic farming goes under the nutritional stress conditions. This secondary metabolites

formation takes place, when the crop passes through a phase of nutrient stress mechanism.

So, there is secretion of formation of pyto hormones or the pyto chemicals in the plant body, that creates the, that causes for the formation of secondary metabolites and that has a health benefit means, that protect the human being from many type of the chronic diseases like one of the hard disease is a cardiovascular disease, hard disease or the cancer.

Because now cancer is very common so, to fight against cancers the product to have the more contents of the secondary metabolites and organic products are expected to have higher content of this secondary metabolites.

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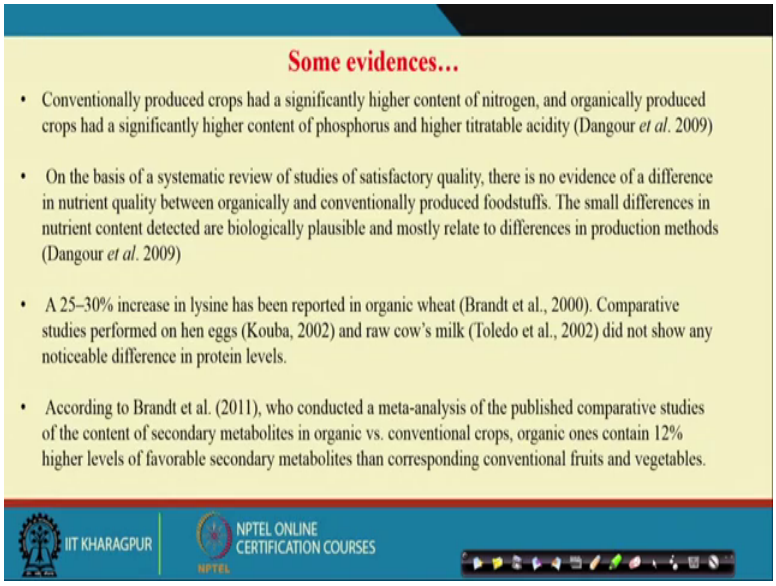

And the some of the evidences you can see the here the conventionally produced crops have significantly higher content of nitrogen and organically produce produced crop have significantly higher contain of phosphorus and higher titratable acidity. That means, now if you see the nitrogen content, this is a obvious appears because, the quick supply of nitrogenous fertilizers are the nitrogen available in the soil, the plant expected to have the higher nitrogen contents and the atmosphere, if sometimes you say that the nitrate content is a higher in conventional food as compared to organic foods, we need nitrates certain limits, but the excessive nitrate may have the will have the adverse effect on the human health.

But the organic produce has been reported to have the higher phosphorus content as compared to conventional produce. On the basis of systematic review of studies of satisfactory quality there is no evidence of a difference in nutrient quality between organically and conventionally produced foodstuffs, this small difference in nutrient content detected are biological plausible and mostly related to difference in the production methods.

So, same for they have seen the Dangour et al 2009 so, they have reported that the because the organic produce content higher phosphorous content as compared to the conventional or the chemically produced foodstuffs, but in general if you say. So, there is no significant difference in the nutritional compositions between the organic and the chemically produced food.

And the other authors, they have said that as a 25 to 30 percent increase in lysine has been reported in organic wheat. Compared to studies from performed on hen eggs and the raw cow's milk did not show any noticeable difference in protein levels.

So, there is a different reports some report says, there is a lysine there is a higher content lysine's in the organic wheats and if you say e x or the cow milk. So, there is no difference the protein content in the organic milk or the conventional produced milk or the egg. According to Brandt et al 2011, who conducted a meta analysis of the published comparative studies of the content of secondary metabolites, in a organic versus conventional crops just say, organic ones content of 12 percent higher level of favorable secondary metabolites then, corresponding conventional fruits and vegetables.

So, this report they have seen that, the secondary metabolites contents are higher in organic fruits and vegetables as compared to the chemically produced fruits and vegetable. So, there are the different opinions from different researchers, but if you see in majority cases many cases. So, there is a report has been found that, organic products the though there is no difference in the essential elements as you say either the. So, macro nutrients, micro nutrients but so, the as with respect to the secondary metabolites the organic products has superiority they have the higher content as compared to the conventional products.

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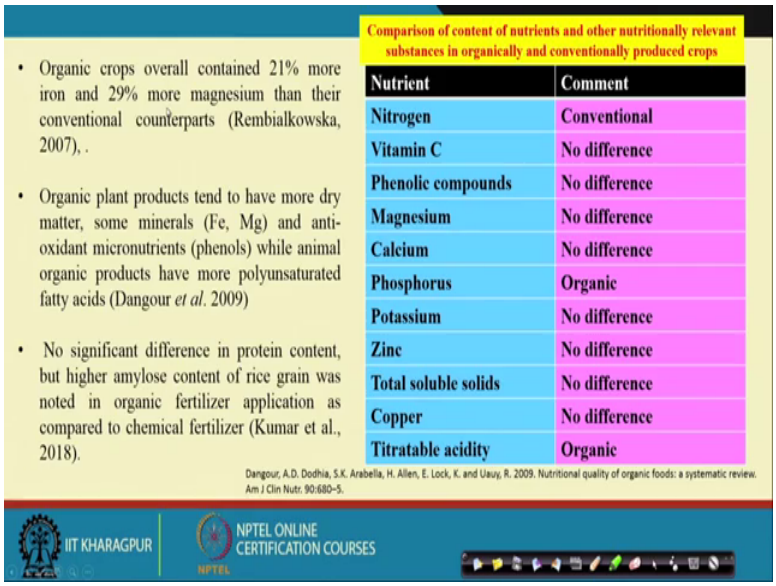

And see the organic crops overall content 12 21 percent more irons and 29 percent more magnesium, then there conventional counterparts similarly, they Dangour et al 2009, organic plant product tend to have more dry matter and some minerals like iron, magnesium and anti oxidant micronutrients, phenols while animal organic products have more polyunsaturated fatty acids.

So, the plant products they contents more of micronutrients as because you know this is also expected, because as your applying the organic fertilizers, they contains most of the micro nutrients. So, the micro nutrient contents of the crops expect to be higher having the organic farming as the annual products, they have the more poly unsaturated fatty acids that is good for the health for the human health.

You should go for the poly unsaturated fatty acid like olive oils or the omega fatty acids, they have the poly unsaturated fatty acids for the for the good for the human health point of view. And the other reports as a Kumar et al 2018, this is the research from our own experiment no significant difference in protein content, but higher amylose content of rice then, who was noted in organic fertilizer application as compared to chemical fertilizer. So, we had this experiment for the past more than 4 year sorry 5 years. So, this experiment was conducted for the rice chickpea cropping systems. So, may be 7th and 8th years of the experiments, where have seen the chemical fertilizer, organic fertilizer, then they do not deform much with respect to protein contents are specially the nitrogen.

So, nitrogen contents in the rice grain, but if you see the amylose content on rice grain was significantly higher in organic treated plot as compared to chemical fertilizers treated plots and this is the in general opinion from the Dangour et al year 2009, nutritional quality of organic foods a systematic review.

So here say that nitrogen contents if you see the n content conventional food has the higher n content as compared to the organic foods; that means, as your supplying chemical fertilizers or nitrogen is quickly available easily available from the chemical fertilizers, that increases contents of the food products as compared to organic farming and vitamin C, there is no such difference and also they have reported phenolic compounds, no difference magnesium, no difference calcium, no difference as phosphorus the organic products contents, higher content of phosphorus as compared to conventional products.

The reason for this the phosphorus available in soil is higher in organic farming as compared to chemical farming, because the microbial activity is higher in case of organic farming and they do help in phosphorus solubilizing, in the soils and raising the pH because one the phosphorus ability depends upon the pH of the soil and using organic fertilizer that bring the pH to neutral range and most of the bacteria phosphate solubilizing bacteria, there active those ph range and the applying organic fertilizer also that increases, the population of phosphate solubilizing bacteria and they do help in release of phosphorus in the soils, bring the phosphorus insoluble form and making it available for the crop plants and; that means, the reason for the having the noting, the higher phosphorus content in the crops grown in organic as compared to chemical farming.

And the potassium, see there is no such difference and zinc no difference, total soluble solids no difference, say copper also no difference and titratable acidity also is in higher in case of the organic products as compared to conventional product.

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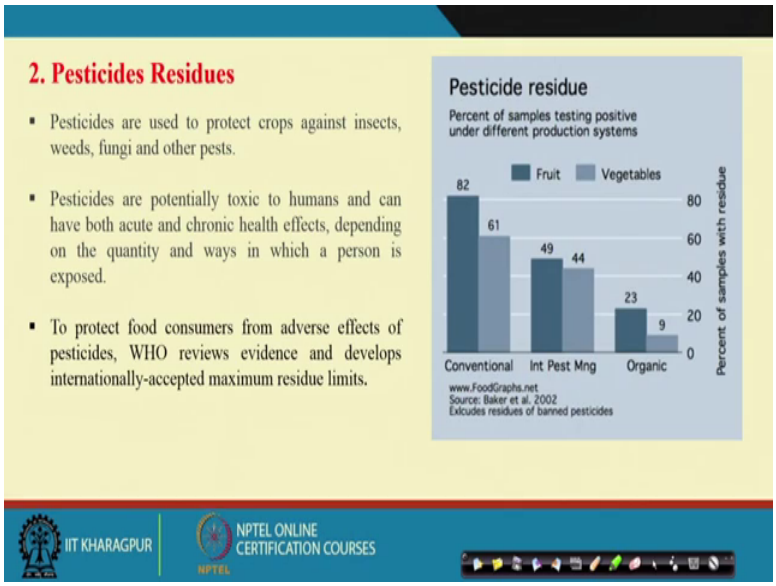

So, similarly, as you see nutrients if you see the pesticide residue, but no doubt unlike nutrients pesticide residue in the products so, there very very low in organic products as compared to conventional product. This is well established and everybody see this is this is not unlike chemical fertilizers, this is proven and established information that all the organic product will have the lesser and lesser pesticide residue as compared to conventional products or the products grown under chemical fertilizers and the chemical pesticides.

As you see here the pesticides are used protect crops against insect, pests, diseases like a the fungus and other weeds pesticides are potentially toxic to humans and can have both acute and chronic health effects depending on the quantity and the ways in which a person is exposed to pesticides applications are the use. To protect the food consumers from adverse effect of pesticides World Health Organization's reviews evidence and develops, internationally accepted maximum residue limits in the foods.

So, in the pesticide contents so, if you see the right hand side figure here, that shows the pesticide residue in the products of different management practices like either, you can go for the conventional management like use of chemical fertilizers or the integrated pest managements. Where the chemical and this the biological methods of pest management are together, in conventional only chemical pesticides are used and the organic the way of using organic growing organically using both fertilizer, pesticides through organic

approach at the bio pesticides are used in case of the organic management. So, if you see the pesticide residue of fruits and vegetables.

So, this column shows the fruits and the next column shows the vegetables pesticide residue. So, here this show the percentage of samples with residue, you can see the conventional products 82 percent samples have the pesticide residue the above maximum residue limits, see the m r l. So, there is a maximum residue limits. So, 82 percent of the fruit samples diagnose are detect analyzed having the pesticide residue above the maximum residue limits. Similarly, in that conventional products 61 percent of vegetables have been detected as the pesticide above maximum residue limit, but ; however, where as you can see the organic products only 23 percent of fruits and 9 percent vegetables are detected with pesticide residue and the integrated pest management there in between.

So, that indicate that engine in general the conventional products have the produced from the conversion, the chemical fertilizers are chemical pesticides have the higher content of the pesticides or they are detected as the having the pesticide residue is a very very high or significant higher as compared to the organic products.

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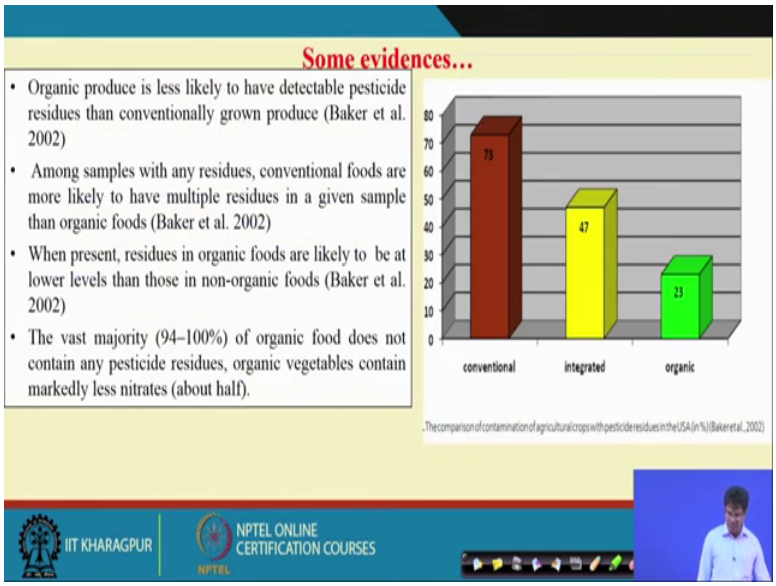

Similarly, there are some other evidence, we can see that organic produce less likely to have detectable pesticide residue than conventionally grown produce, that is a Baker et al 2002 and say here, they have also reported among samples with any residues,

conventional foods are more likely to have multiple residues in a given sample than organic food; that means, the multi the several pesticides can be found in the produce of the chemical pesticides as compared to the organic farming. When present residue in organic foods are likely to be at lower level than those in non organic foods of course, these are m r l the residue limit maximum residue limit, what you see that, you can organic foods have the pest residues, may be lower than the mrl. The vast majority around 94 to 100 percent of organic foods does not contain any pesticide residue. Organic vegetables contain miraculous nitrate, because nitrates also not good for health from the health point of view.

So, there cause damaged in the body nitrates so, most of the organic products they have the less nitrate contents and they do not content any pesticides with a very less the below the less as compared to the conventional or the chemical products.

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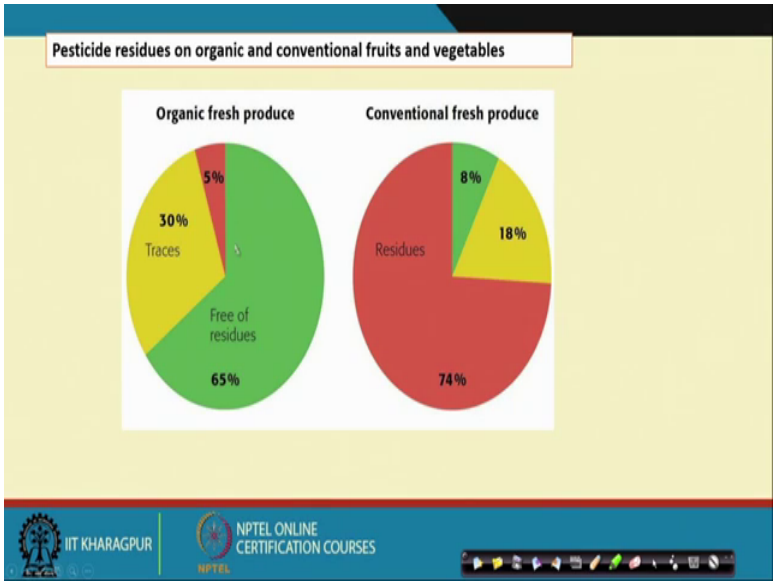

And, if you see this one the pesticide residue on organic and conventional fruits and vegetables so, this is the organic fresh produce and the conventional fresh produce 65 percent of the organic produce, there free of pesticide residue and where as the only 8 percent of the conventional produce are free of residue. So, there is a huge difference because; that means, the around 74 percent of the conventional produce are detected around like having the pesticide residue.

So, in case of the stress residue 30 percent here are 18 percent and mostly 74 percent of the conventional produce have the pesticide residue and in case of organic only 5 percent or less than 5 percent of the organic produce have the pesticide residue.

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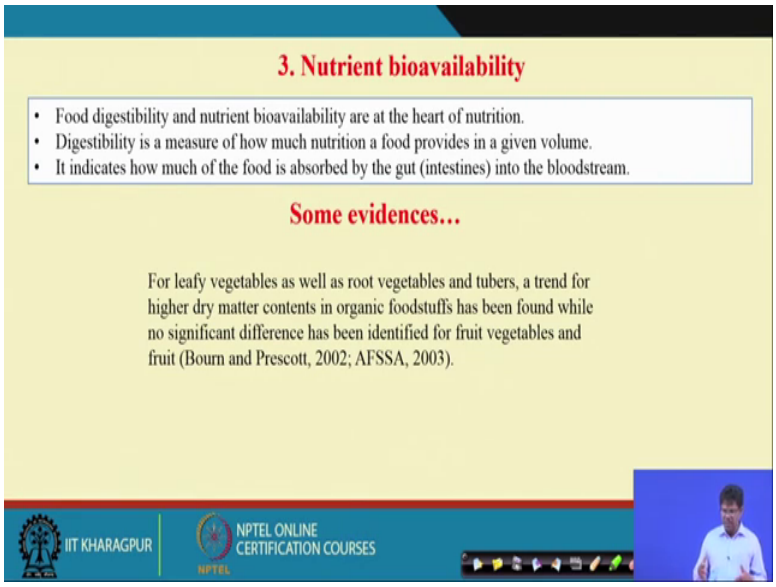

So, then the nutrient bioavailability see this is very important for the what do you mean by nutrient bio availability? That means, as you consume the foods that that food materials should be utilized by the crop how the food material is utilized by the crop; that means, the after digestions how the nutrients is usable or the used by the in the human body.

So, that is a nutrient bioavailability, that is a food digestibility and nutrient bio availability at the are the heart of the nutritions, digestibility is a major is a major of how much nutrition a food provides in a given volume. And second indicates, how much of the food is observed by the got into the bloodstream? That means, the amount of nutrient present in the food the portion of nutrients is observed by the in the bloodstream, that is a nutrient bioavailability. So, though you do not have the many say information about the nutrient bioavailability for this specially for the organic foods and the conventional foods.

There few thus, if food is suggest that for leafy vegetables as well as the root vegetables and tubers, it train for higher dry matter content in organic foodstuffs has been found,

while no significant difference has been identified for fruits and vegetables, the fruit vegetables and the fruit.

So, higher dry matter content; that means, that indicate there is a the bio availability, there is a fiber content that that the better digestibility and the better bioavailability about there are there are some understanding, some that the organic produce the free from a pesticide residue.

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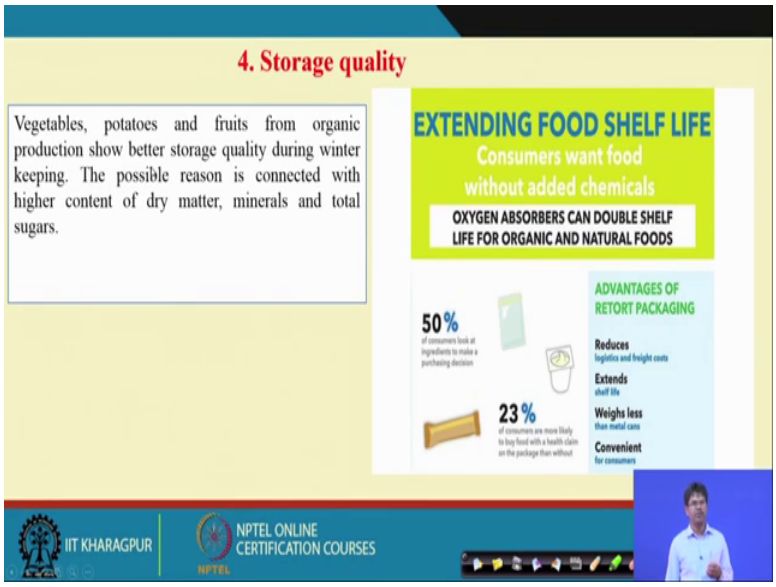

So, that there will be better the bioavailability of nutrients in the human body and the storage quality, if you see the organ shelf life of the storage as this is grown.

So, without any growth hormones or without any chemical fertilizers or no chemical pesticides, in this case the vegetables like potato and fruit from organic production, show better storage quality or the keeping quality during winters. This possible reason is connected with the higher continent of dry matter organic foods and minerals and total sugars in organic that that increases shelf life of the organic foods.

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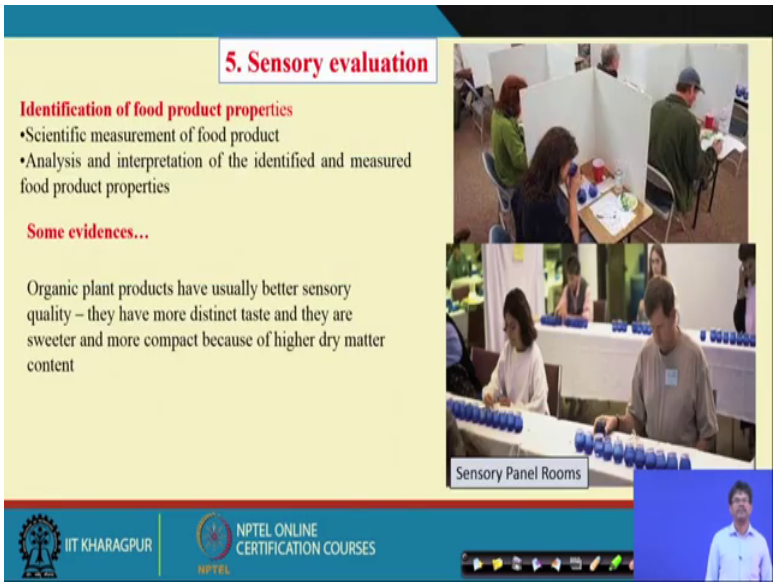

And the sensory evaluations so, that you see that is a usually the test, say test of the organic foods. The organic plant products have usually the better sensory quality, they have the more distinct test and they are sweeter and more compact, because of the higher dry matter content.

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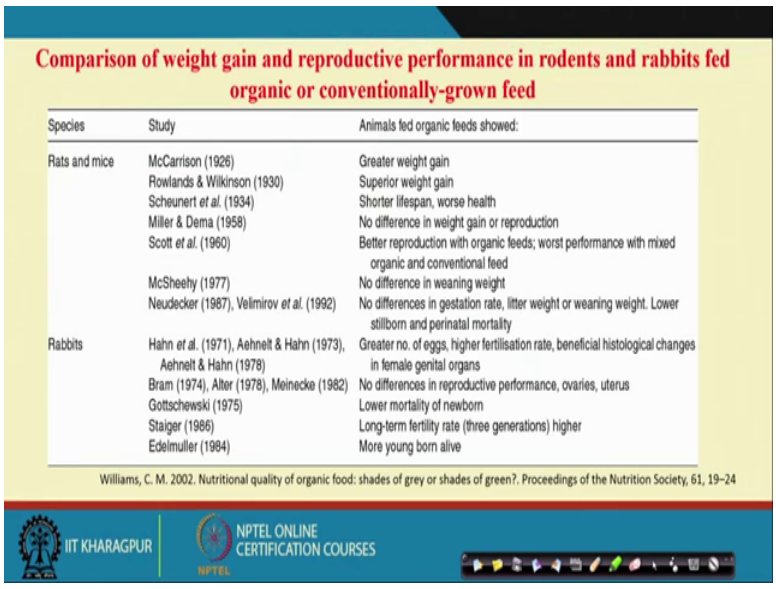

So, there are some test conducted sensory evaluations, there are report that the organic products have the test have better test as compared to the chemical products. So, there

are some comparison of weight gain and reproductive performance in rodents and rabbits, fed organic and conventionally grown food you can see the rodents for this.

So, there are many re studies have conducted and this is the some they have reported in one case greater weight gain, some cases there is superior weight gain also there, shorter life span in one case the Scheunert et al 1934. They are reported there is a shorter lifespan and ores health in organic foods by consuming organic foods as compared to conventional food and no difference in weight grain.

In other they have reported data re-productions with organic feeds worst performance with mixed organic and conventional feed. Similarly, there is no difference in this case, rabbits there reported greater number of a x, higher fertilization rate, beneficial histological changes, in female generation organic due to the organic foods. No difference in re-productive performance, lower motility of the new born in organic foods, long term fertility rate in case of the organic foods and more young born remain alive in organic food.

So, these are the reports mixed reports, but most of the cases, they do evidence organic foods have better health effects and have the between advantage in the animal as the as the animal body so as compared to the conventionally grown foods.

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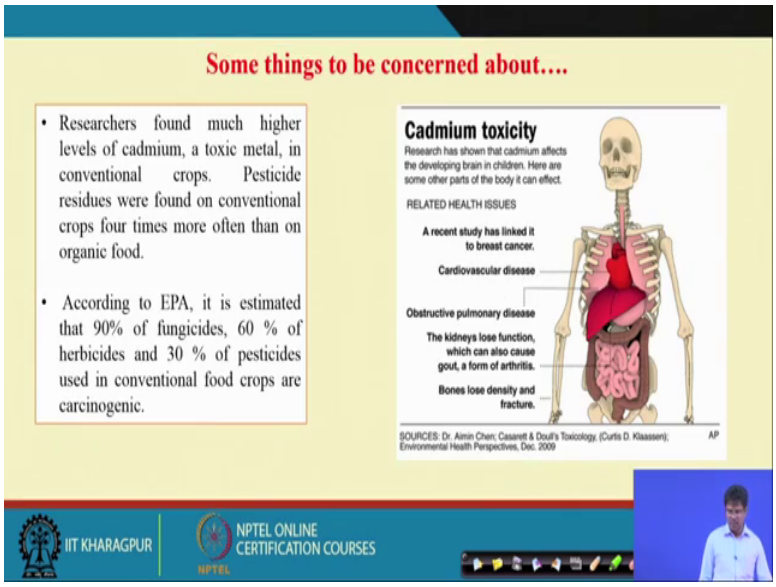

And something that we concerned about that, you know the cadmium toxicity mostly that use the chemical pesticides, they contents the cadmium.

So, this is there is a huge concern for the human health. Researchers found that much higher levels of cadmium a toxic metals in conventional crops, pesticide residue found on conventional crops 4 times more often than the organic foods. So, the cadmium contents are higher in conventionally produce food as compared to the organic foods.

According to Environmental Protect absence of USA is estimated that, 90 percent of fungicides, 60 percent of herbicides and 30 percent pesticide used in conventional food crops are carcinogenic, they have the cadmium; that means, as cadmium contents and due to high cadmium content, if you are consuming the foods having the higher cadmium content, what will happen the health effects? It has a cardiovascular, a recent study has linked it to breast cancer, cardiovascular disease then abstractive luminary disease, the kidney loose functions, which can also cause Goth and a form of arthritis the bones lose density and the (Refer Time: 31:17) fracture due to high cadmium content.

So, taking the foods of having higher cadmium contents as; that means, the foods having high pesticide residue, they have the many heavy metals having heavy metals contents. So, they have the effect, because many disease like cancer, cardiovascular disease so, that has a bad effect on human health.

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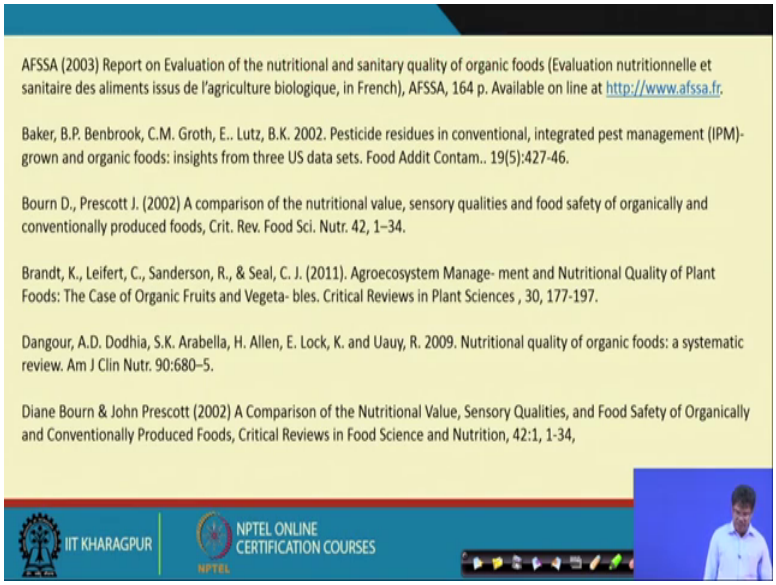

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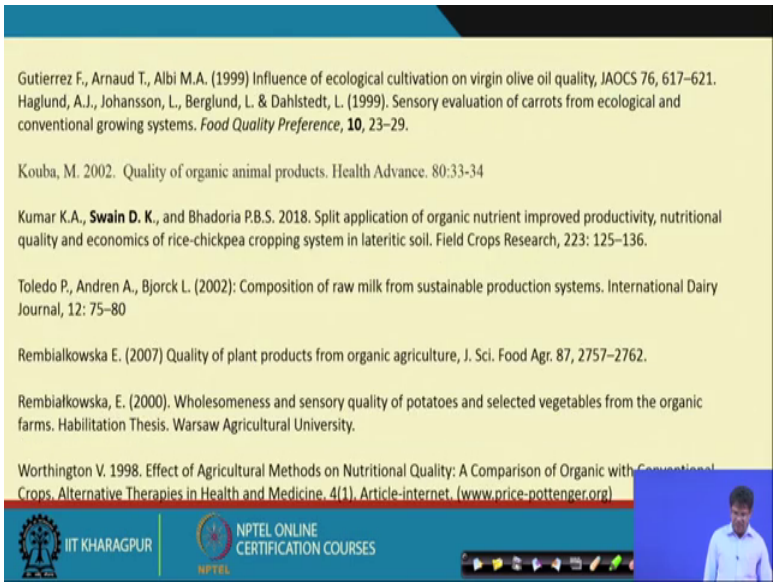

So, these are the some of the references as we are discuss the reference are sited there and this references are mentioned. You can follow this references as you have explained earlier and you can get detailed informations by going through the literature. So, this lecture of by having you can even have got the knowledge about the quality of the organic foods and how the organic foods superior so, about the conventional foods; that means, you have the main purpose is going to have organic foods to have the better quality to have a better health. So, you have to feed the population, young population, over population, every hour every age of populations, they need the good quality foods to maintain their health and to have a better health.

As you see the cancer patient population is growing over the time, everyday you can find the many cancer patient populations, adding in the nation and the world as well and to minimize the deadly disease of cancers. We need to control our food because, food regulates the disease to several to better extents, how can have a better food. So, that we can have a better health, with these I conclude this lecture.

Thank you very much.