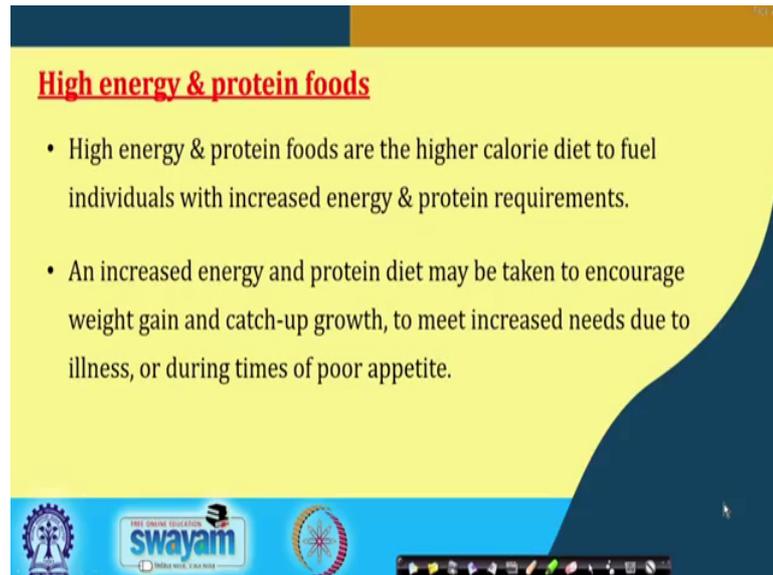


Novel Technologies for Food Processing and Shelf Life Extension
Prof. Hari Niwas Mishra
Department of Agriculture and Food Engineering
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Lecture - 53
High Energy RTE Food Paste (Part 1)

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High energy & protein foods

- High energy & protein foods are the higher calorie diet to fuel individuals with increased energy & protein requirements.
- An increased energy and protein diet may be taken to encourage weight gain and catch-up growth, to meet increased needs due to illness, or during times of poor appetite.

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Hello everybody, today we will a study about High Energy Ready to Eat Food Paste. High energy and protein foods are the foods that provide high calorie in the diet of the individuals so the fuel the individuals with increased energy and proteins. An increased energy and protein diet may be taken to encourage weight gain and catch up with growth, to meet increased needs due to illness, or during times of poor appetite.

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High energy ready-to-eat (RTE) food paste

- High energy RTE food pastes are energy dense and micronutrient enhanced pastes which are commonly used in therapeutic feeding.
- These soft foods are a homogenous mix of lipid and protein rich foods containing essential micronutrients.
- These foods are suitable for the treatment of malnourished children particularly those with severe acute malnutrition (SAM).

The slide includes an image of two packets of RTE food paste and a small video inset of a speaker in the bottom right corner. The footer features the Swamyam logo and the text 'FREE ONLINE EDUCATION swamyam MEDIA WISE. LEARN WISE.'

High energy ready to eat food paste are energy dense and micronutrient enhanced pastes which are commonly used in therapeutic feeding. These soft foods are homogeneous mix of lipid and protein rich foods containing essential micronutrients. These foods are suitable for the treatment of malnourished children particularly those suffering with severe acute malnutrition problems.

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Advantages of high energy RTE food paste

- High energy fortified food.
- Contain oilseeds/cereals, oil, sugar, milk powder and micronutrient premix.
- Has low a_w (moisture content <2.5%), and does not support bacterial growth.
- Has comparatively long shelf life.
- Has smooth, homogenous texture (particle size < 200 μ) and pleasant flavor.
- Convenient to use and can be given safely for home consumption.
- Can be consumed directly without prior dilution/ cooking.

The slide features a list of seven advantages in white boxes with orange borders. The footer includes the Swamyam logo and the text 'FREE ONLINE EDUCATION swamyam MEDIA WISE. LEARN WISE.'

Advantages of the high energy ready to eat food pastes include that these foods; obviously, they have high calorific value and they are fortified with needed

micronutrients. They contain oilseeds, cereals, oils, sugar, milk powder and micronutrient premix. They have low water activity and therefore, because of low moisture content and low water activity they do not support the microbial growth that.

So, they have comparatively longer shelf life also they are a smooth homogeneous paste, they have a smooth texture and their particle size is generally less than 200 micron. And very important characteristics of ready to eat food high energy food paste include that they have pleasant flavour, they are convenient to use and can be given safely for home consumption, they can be consumed directly they are ready to eat. So, they do not need any prior dilution or cooking or any preparation etcetera before consumption.

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Ideal characteristics RTE food paste

- Good nutritional value (i.e. protein, energy and micronutrients content).
- Amino acid complementation for maximum protein quality.
- Texture should be smooth, uniform paste with small particle size.
- No grittiness, no lumps, no oil separation.
- Easy to squeeze out of the sachet.
- Light brown to cream in colour.
- Adequate shelf life and stability.
- Resistance to bacterial contamination.
- Highly palatable with a good taste.

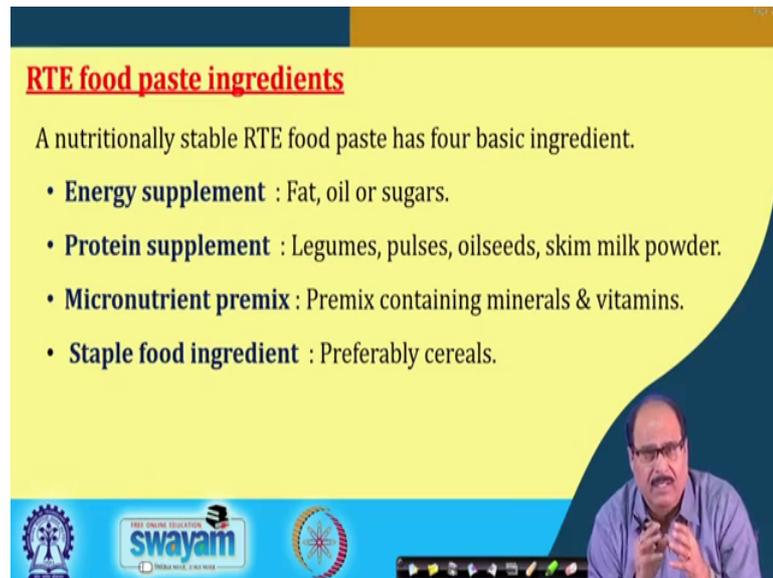
The slide features a yellow background with a dark blue curved shape on the right side. At the bottom, there are logos for the Ministry of Education, Government of India, and the Swamyam initiative.

So, what a ready to eat food paste should have that, ideal characteristics of a ready to eat food paste include that is it should contain good nutritional value that is the protein, energy and micro nutrient contents of ready to eat food paste should be a to up to the appropriate levels. It should provide amino acid complementation for maximum protein quality that is the amino acid from different sources may be from milk sources, may be from the vegetable sources another sources. So, that they become complementary to each other to provide required essential amino acids to the body.

The texture should be smooth; obviously, they should be uniform in their size and characteristics, the particle size etcetera, they will be no grittiness, no lumps or no oil

separation, this should be easy to squeeze out of the sachet, it should have a light cream or brown colour, should have adequate shelf life and stability, it should be resistant to bacterial contamination and more importantly it should be highly palatable it should have a good taste.

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RTE food paste ingredients

A nutritionally stable RTE food paste has four basic ingredients.

- **Energy supplement** : Fat, oil or sugars.
- **Protein supplement** : Legumes, pulses, oilseeds, skim milk powder.
- **Micronutrient premix** : Premix containing minerals & vitamins.
- **Staple food ingredient** : Preferably cereals.

So, in general the characteristic components that are the ready to eat food paste ingredients are maybe they can be broadly categorised into four groups; that is one group is that those ingredients which provide energy are which are used as an energy supplement and these include fats, oils or sugars. Say, other set of ingredients are used as protein supplement like legumes, pulses, oilseeds or skim milk powder etcetera. And then micronutrient premix that is the premix containing required vitamins and minerals and then apart from this there should be some staple food ingredient preferably cereals etcetera in which all these energy supplements, protein supplements, micronutrient premix etcetera they are also.

There should be the (Refer Time: 05:49) staple food supplement should be used as a base material for the preparation of the and this; obviously, the base material should be that easily should be liked by the person concerned for whom these food is prepared who are likely to consume.

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Common ingredients for RTE food pastes

Peanut butter	<ul style="list-style-type: none">• Raw peanut have been roasted, split and ground, without added oil, salt or preservatives.• In most areas of the world where peanuts are grown, a commercial food processing company makes peanut butter.
Vegetable oil	<ul style="list-style-type: none">• Several types of oil made by standard commercial methods may be used.• Rapeseed oil and soybean oil have the advantage of providing a good balance of essential fatty acids.
Sugar	<ul style="list-style-type: none">• Commercial sources of granulated brown or white sugar in the form of fine powder ($< 200 \mu$) can be used.

So, common ingredients for ready to eat food paste are the peanut butter that is the raw peanut which is a after roasted, split and ground, without added oil, salt are preservatives. So, it is the some sort of paste prepared from a roasted peanuts is splits.

And in most areas of the world where peanut are grown a commercial food processing company makes peanut butter. So, it is easily available. So, that is one ingredient then the vegetable oil is another important ingredient ready to eat food paste. So, there are several types of oil like sunflower oil, soybean oil etcetera etcetera.

So, they can be used, but rapeseed oil and soybean oil they have the advantage of providing a good balance of essential fatty acids. So, these are sometime preferred then sugar, the commercial so cross of desired granular size may be white sugar or brown sugar may be ground to proper size and in the farmer free flowing powder can be is used, its size may be less than 200 micron.

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Slide 2 content:

Cereal powders	<ul style="list-style-type: none">• Low cost paste include cereal based formulation e.g. Bengal gram, maize, etc.
Milk powder	<ul style="list-style-type: none">• Skimmed milk powder, full-cream milk powder, whey protein powder can be used in formulation.
Vitamin & mineral premix	<ul style="list-style-type: none">• High bioavailable vitamins and minerals should be added.• The premix should not alter the characteristic of the product.

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Then cereal powders like, low cost powder include cereal based formulation such as Bengal gram, maize, etcetera. Then a skim milk powder, full-cream milk powder, whey protein powder etcetera can be used as a protein complimentary sources, then vitamins and minerals premix high bioavailability of the vitamins and minerals should be insured while preparing the vitamin and mineral premix. The premix should not alter the characteristics of the product that is it should not have any a specific flavouring and other characteristic. So, it should not interfere with the flavour and colour of the main product.

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Slide 3 content:

Antioxidants	<ul style="list-style-type: none">• Stabilize the product.• Prevent oil oxidation.
Emulsifying agents	<ul style="list-style-type: none">• Avoid oil separation and improve the binding properties.• Lecithin (max. 0.5g/100g), mono & diglycerides (max. 2g/100g) can be added without any adverse effect.
Flavoring	<ul style="list-style-type: none">• Used for taste masking.• Natural flavors are preferred.

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Then apart from that since the oils are being used in the formulation, then it is better to add some antioxidants, to stabilize the product, to prevent oil oxidation, also some emulsifying agents which avoid the separation of oil and also improve the binding properties of the material.

So lecithin, normally lecithin maximum 0.5 gram per 100 gram of the prepared material are mono and diglyceride, maximum 2 gram per 100 gram of the prepared materials can be added without any adverse effect. Flavourings sometime used for taste masking, if the material which are used they have some characteristic flavour. So, they can be masked using a by adding some natural flavours derived from the natural sources; so, natural flavours are always preferred.

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Nutritional composition of RTE-TF according to UNICEF/WFP/WHO

Component	Recommendation
Macronutrients	
Moisture (% w/w)	2.5 max
Energy (kcal/100g)	520 -550
Protein (% of energy)	10-12
Lipids (% of energy)	45-60
CHO, Ash, Fiber (g/100g)	---
Microbiological safety	
Total plate count (CFU/g)	<10,000
Yeast (CFU/g)	< 10
Mold (CFU/g)	<50
<i>E. coli</i> (CFU/g)	- ve

Proteins 10-12% of total energy

Energy 520-550 kcal

Lipids 45-60% of total energy

RTE Food paste

The nutritional composition of ready to eat food paste according to the UNICEF or World Food Program or WHO pro program, WHO they have recommended particularly, for severely acute malnutrition children. They have provided some formulation that they should contain about moisture 2.5 percent maximum, energy 520 to 550 the range, protein should provide less a about 10 to 12 percent of the total energy and a 40 to 45 to 60 percent of the total energy should come from the lipid sources.

Then requirement for a this product at in the standards include, it should have less than 10000 CFU; Colony Forming Unit per gram, yeast count less than 10, mould less than 50 and equalise should be negative.

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Micronutrients			
Sodium (mg/100g)	290 max	Vitamin E (mg/100g)	20 (minimum)
Potassium (mg/100g)	1100-1400	Vitamin K (µg/100g)	15 -30
Calcium (mg/100g)	300 - 600	Vitamin B1 (mg/100g)	0.5 (minimum)
Phosphorous (mg/100g)	300 - 600	Vitamin B2 (mg/100g)	1.6 (minimum)
Magnesium (mg/100g)	80 -140	Vitamin C (mg/100g)	50 (minimum)
Iron (mg/100g)	10 -14	Vitamin B6 (mg/100g)	0.6 (minimum)
Zinc (mg/100g)	11 -14	Vitamin B12 (µg/100g)	1.6 (minimum)
Copper (mg/100g)	1.4 - 1.8	Folic acid (µg/100g)	200 (minimum)
Selenium (µg/100g)	20 - 40	Niacin (mg/100g)	5 (minimum)
Iodine (µg/100g)	70 -140	Pantothenic acid (mg/100g)	3 (minimum)
Vitamin A (mg/100g)	0.8 - 1.1	Biotin (µg/100g)	60 (minimum)
Vitamin D (µg/100g)	15 -20		

So, these are some of the standard set by the shape and WFO for that or a ready to eat food paste for millinery children similarly, that is the micro nutrient requirements for these foods are also recommended, like it should have come little higher amount of potassium, calcium, phosphorus etcetera. May be co potassium may be in the range of 1100 to 400 milligram per 100 gram.

This phosphorus is recommended to be in the range of 300 to 600 milligram. Similarly, even vitamins content also they are recommended like vitamin e minimum should be 20 milligram per 100 gram of the paste and biotin should be minimum 60 microgram per 100 gram. So, in this way that is the different vitamins and mineral composition another composition is recommended.

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Quality control in selection of raw ingredients

Aflatoxin contamination

- This toxin is produced by an *Aspergillus* species of fungus (molds), which contaminates the peanuts after they have been harvested.
- Consumption of aflatoxin can result in hepatic oxidative stress, and predispose the individual to hepatic cancers.
- Very high doses of aflatoxin can produce acute intoxications and moderate doses may depress child growth.

Care

- Peanut should be stored in a cool, dry environment.
- Treatment of fungicide.

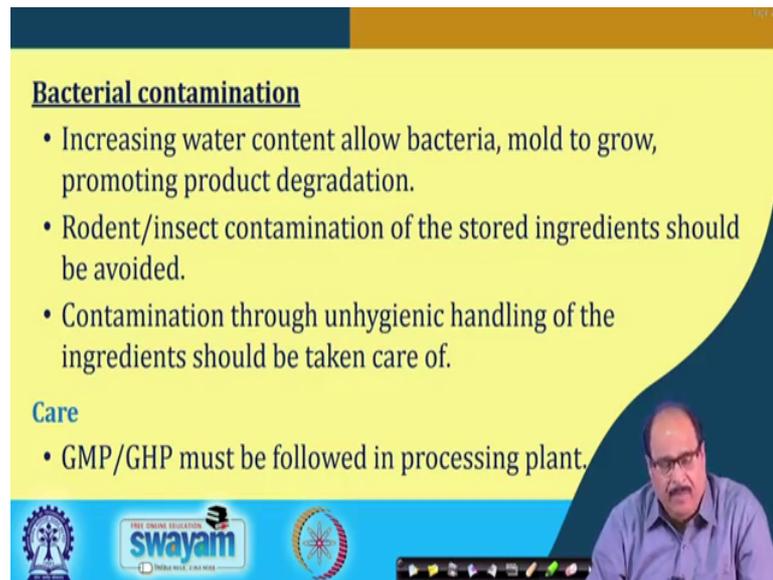
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So, this various raw materials are taken and they should they are used to prepare for ready to eat food paste be fitting to those recommended nutritional composition. So, the quality control in selection of raw ingredient very important factor particularly that it a this a it must be ensure because oilseeds, peanut etcetera are used, they are good substrate for the growth of fungi or mold particularly aspergillus and such other molds, which a cause the production of aflatoxin

So, it must be insured that this raw material, it is normally this aspergillus mold contaminates the peanuts etcetera after harvest and it can grow and produce toxin during post harvest process and operation during storage in the field etcetera. So, every possible care should be taken that the raw material is free from aflatoxins alright also so it is should be free from the mold contamination response; mold response contamination of mold responsible for the aflatoxin production.

So, in storage room during transportation etcetera there is the care should be taken that a cool, dry environment is maintained; also some time is required the storage facility are etcetera should be treated with a suitable fungicides etcetera.

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Bacterial contamination

- Increasing water content allow bacteria, mold to grow, promoting product degradation.
- Rodent/insect contamination of the stored ingredients should be avoided.
- Contamination through unhygienic handling of the ingredients should be taken care of.

Care

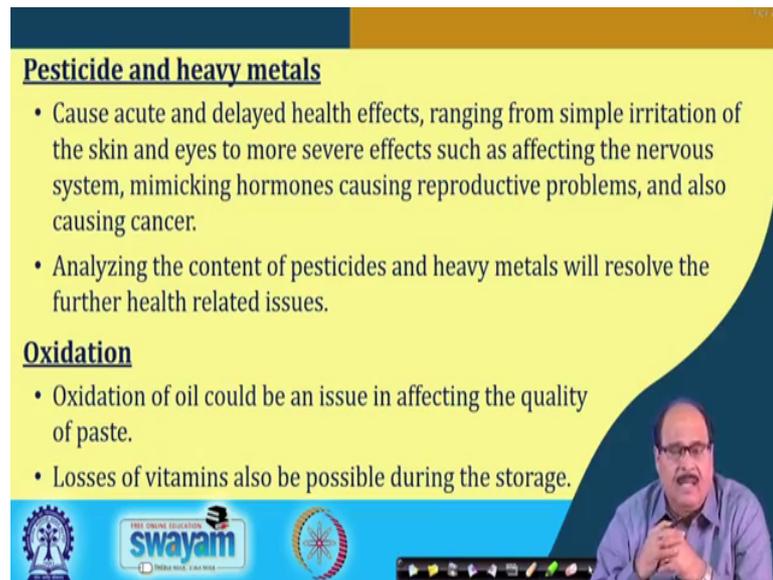
- GMP/GHP must be followed in processing plant.

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Then bacterial contamination also be ingredient it must be insure that it is free from any bacteria or such other contaminants which might be deleterious to health, rodents insects contamination of the stored ingredients should also be avoided, contamination through unhygienic handling of the ingredients should be taken care of.

So, for all this the nut shell I can tell you; let me tell you that a good manufacturing practices or good hygienic practices must be followed in the processing plant, in the storage facility everywhere to make sure that all the material are ingredient, they are free from any contaminating bacteria is molds in a paste etcetera there are good quality.

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Pesticide and heavy metals

- Cause acute and delayed health effects, ranging from simple irritation of the skin and eyes to more severe effects such as affecting the nervous system, mimicking hormones causing reproductive problems, and also causing cancer.
- Analyzing the content of pesticides and heavy metals will resolve the further health related issues.

Oxidation

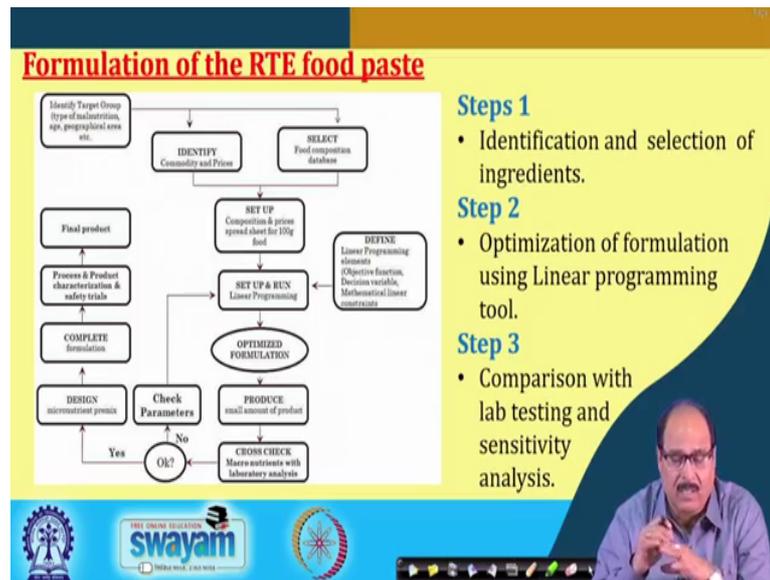
- Oxidation of oil could be an issue in affecting the quality of paste.
- Losses of vitamins also be possible during the storage.

Then pesticides and heavy metals they cause acute and delayed health effects, ranging from simple irritation of these skin and eyes to more severe effect such as affecting the nervous system, mimicking hormones causing reproduction problem, and also causing cancers.

So, the contents should be all the raw material and even in grade processed ingredient etcetera which are used in the formulation, they should be suitably analysed and it should be ensured that this should not have any detectable limit of these pesticides or heavy metal heavy metals etcetera. Similarly, the oxidation as I told you in the ingredients of anti oxidants are added etcetera.

So, every possible effort should be made that this oxidation of the oil does not take place, because it may a seviourly or seriously affect the quality of the product, even losses of vitamins are also possible because of the undesirable conditions are sub standard conditions during a storage etcetera. So, even some of the vitamins may get oxidised, a proper conditions are not maintained it metal a pro oxidant etcetera they are the system. So, every possible care should be there taken that oxidation is also avoided.

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So, I will now come toward discuss the formulation of ready to eat food products. So, there is the formulation because that is very very important in the proper selection of the ingredients alright, to make sure that and they are a level; to decide the level of each ingredient that in what proportion they should be mixed so that we get desired quantity of all the micronutrient as well as macronutrient in the product.

So, it has three steps that is the formulation. Step 1, first the select; selection and identification of the ingredient that is first a identify the target group they like type of malnutrition, whether it is a saviour acute malnutrition, or it a moderate acute malnutrition, or it is a general malnutrition are even this same step can be used for preparation of ready to eat food paste or formulation. For any the group of persons are part are like for example, the food for diabetic p people innocent people.

So, first a decide the target that for which group of persons people we are going this as doing this formulation and then find out the suitable foods; select the suitable foods. Then identify the commodity, sometime the price of the commodity is taken as a important criteria for this.

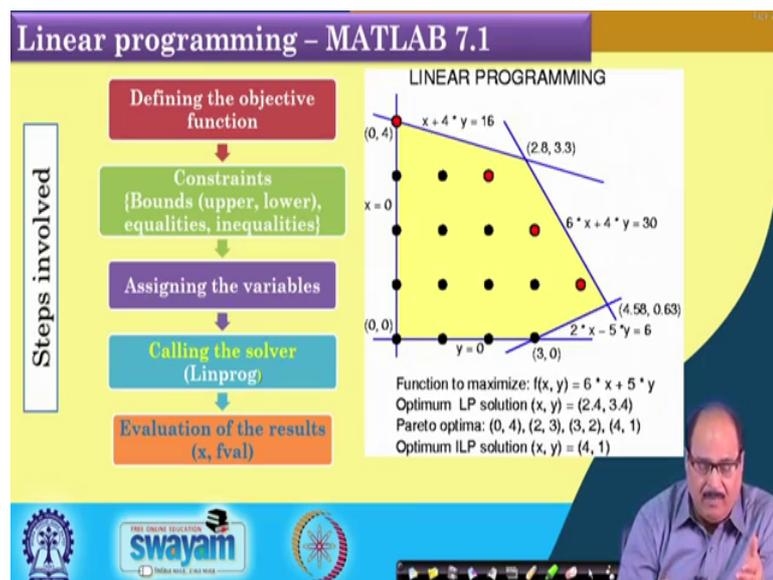
Then after this finalization then second step is the optimisation of the formulation and this can be done using mm different software etcetera, but most commonly used software is the linear programming tool; linear programming is used to optimise that decide that the ingredient level.

And then finally, the comparison with the lab testing that here you see in this flowchart that is etcetera this I will run the linear programming run and for the ruining the linear programming I will show you the, may be in the next slide also that is there are different object functions to be desired objective functions, upper bound, low lower bound etcetera are a provided to the linear programming.

And then finally, it program is run applied formulation, it produces is give decide that yes, it provide that x y z values on the basis of the provided input, it says that yes these are the different ingredient can be used in this proportions.

So, was the this is the result has been obtained from that linear programming software; obviously, it should be cross check may be for the micro nutrient content, may be for the other quality content in the laboratory testing and if the testing says ok, we can go and one can for proceed further using that result, otherwise if this testing is not correct its says no then check the parameter. So, that may be in the objective functions or may be this a constraints or other things are very ingredient selection. So, and this is a corrections may be made. So, once this program whatever result has been given by the program if the same combination in laboratory testing if the desired then one can proceed ahead.

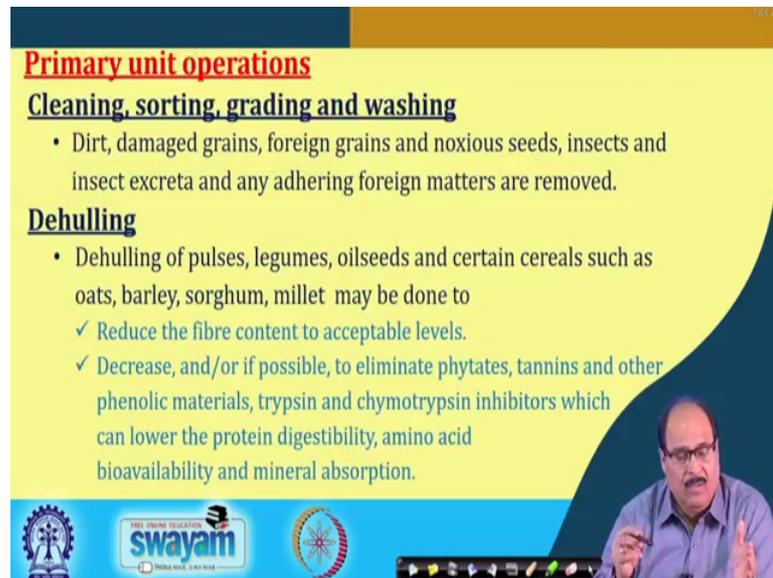
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So, this is the same thing what I already explained you that ingredient programming, which is the in MATLAB 7.1 can be that is the first is that define the objective function,

then define the constraint may be bounds, upper bounds, lower bound, equality, inequality etcetera then assigning the problem, calling the solver, linprog solver and then evaluation of the result.

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Primary unit operations

Cleaning, sorting, grading and washing

- Dirt, damaged grains, foreign grains and noxious seeds, insects and insect excreta and any adhering foreign matters are removed.

Dehulling

- Dehulling of pulses, legumes, oilseeds and certain cereals such as oats, barley, sorghum, millet may be done to
 - ✓ Reduce the fibre content to acceptable levels.
 - ✓ Decrease, and/or if possible, to eliminate phytates, tannins and other phenolic materials, trypsin and chymotrypsin inhibitors which can lower the protein digestibility, amino acid bioavailability and mineral absorption.

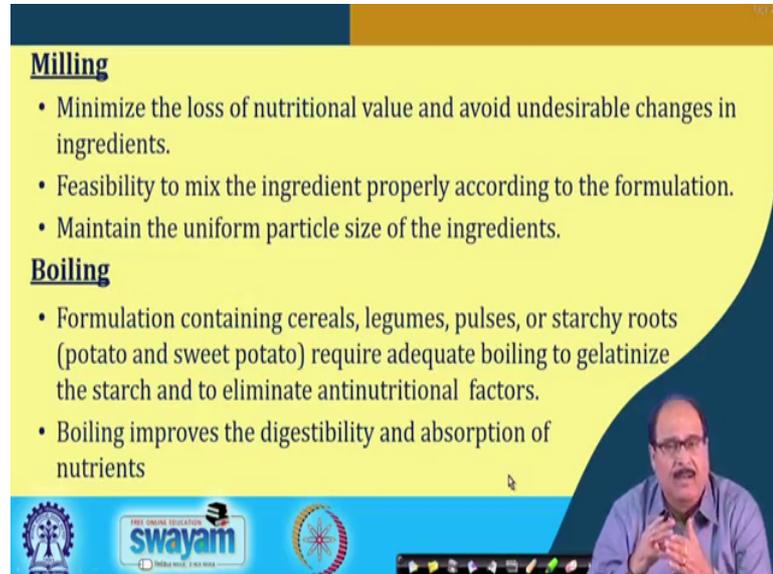
So, after the formulation has been made, it has been decided that all the ingredient in which proportion they have to be used in the for product, then next comes the processing may be primary processing and then final secondary processing.

In the primary unit operations include that is depending up on the ingredient like raw materials etcetera, cereal pulse grains etcetera. They may be subjected to the obvious family processing like cleaning, sorting, grading, washing etcetera. So, all dot, damaged grain, foreign grains, noxious seeds, insects etcetera should we removed if there is any prominy where some metal peace are insect, excreta etcetera in the grain all those things may be. So, grains should be free from any foreign undesirable contaminant and toxic etcetera.

Then the next step is that dehulling; that is dehulling of the pert pulses, legumes, oilseeds, cereals, etcetera that is a utilising using a suitable dehulling machines that is outer hull or cover seat coat etcetera is removed. So, mainly the dehulling facilitates or it reduces the fibre content of the material to acceptable levels it decreases and are it possible it also eliminates; sometimes the phytates, tannins and other phenolic materials. It remove some trips in an chymotrypsin, inhibitors which can lower the protein

digestibility, amino acid bioavailability and minerals absorption etcetera if their present in the mix. So, grains are suitably dehulled hulls are removed and splits obtain.

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Milling

- Minimize the loss of nutritional value and avoid undesirable changes in ingredients.
- Feasibility to mix the ingredient properly according to the formulation.
- Maintain the uniform particle size of the ingredients.

Boiling

- Formulation containing cereals, legumes, pulses, or starchy roots (potato and sweet potato) require adequate boiling to gelatinize the starch and to eliminate antinutritional factors.
- Boiling improves the digestibility and absorption of nutrients

Then next is the milling so this using appropriate milling machines, mills etcetera that is grains are converted in to fine powders right. So, it of course, then the milling a care should be taken that there is a minimal loss of the nutritional value etcetera or undesirable changes in the ingredient should not take place in the milling.

So, the major benefit obtain from the milling is that it makes easy mixing of the different ingredients, that is proper mixing and to provide this homogeneous mix are proper formulation becomes easy And also it is done to maintain the uniform particle size of the ingredient because finally, the paste which we are making that should be of a smooth consistency and as per as possible the particle size of all the ingredient should be of same nature. So, that is obtained by the controlled by here by adopting proper milling method.

Then boiling or heat treatment rather sometime even branching etcetera mild it treatment are more heat treatment wet, heat treatment and dry heat treatment should be given and this is depending upon the material like if it is potato or sweet potato they should be boil or they should be launched alright. The purpose may be to gelatinise the starch as well as to eliminate anti nutritional factor etcetera. Then boiling also improves the digestibility and absorption of nutrients.

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Roasting

- Improves colour, texture; extends shelf life and reduces the anti-nutrient factors of cereals and legumes
- Enhances flavour through caramelization and Maillard browning on the surface of the food.
- Improves digestibility and contributes to reduce the bulkiness of formulated food.
- Reduces microorganisms and enzyme activities; destroy insects.
- Increases the nutrient level of grains.

Care : Proper control of the process must be done.

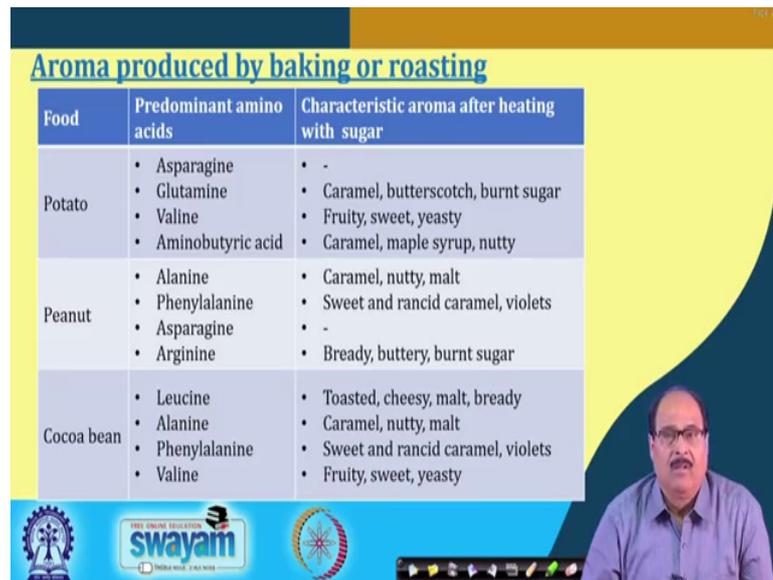
So, some that is the cereals, grains like oil seeds, peanuts etcetera, maize, Bengal gram there the roasted a becomes another a operation that is the they should be roasted because it is ready to eat. So, these mix ready to eat food paste has to be given directly for eating so; obviously, these grains etcetera they should be brought into edible form.

So, this are high roasted at a suitable temperature of course, this roasting process parameter should be properly optimised alright, thus that in any undesirable change in the components right. Desirable properly conducted a roasting improves colour, text texture and extend the shelf life and reduces the anti nutrient factors of the cereal legumes.

It also enhances flavour through caramelization and Millard browning on the surface of the food. It improves digestibility and contributes to reduce the bulkiness of the formulated food, it also that is properly conductor roast a also reduces microorganisms and enzyme activity destroyed insects it increases the nutritional level of the grain sometime right.

So, the care; obviously, as I told you earlier that is the proper control of the roasting process must be done that is it should be conducted in a proper manner. So, has to make sure that undesirable changes are it does not burner nutritional values etcetera are not adversely affected.

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Food	Predominant amino acids	Characteristic aroma after heating with sugar
Potato	<ul style="list-style-type: none">• Asparagine• Glutamine• Valine• Aminobutyric acid	<ul style="list-style-type: none">• -• Caramel, butterscotch, burnt sugar• Fruity, sweet, yeasty• Caramel, maple syrup, nutty
Peanut	<ul style="list-style-type: none">• Alanine• Phenylalanine• Asparagine• Arginine	<ul style="list-style-type: none">• Caramel, nutty, malt• Sweet and rancid caramel, violets• -• Bready, buttery, burnt sugar
Cocoa bean	<ul style="list-style-type: none">• Leucine• Alanine• Phenylalanine• Valine	<ul style="list-style-type: none">• Toasted, cheesy, malt, bready• Caramel, nutty, malt• Sweet and rancid caramel, violets• Fruity, sweet, yeasty

In this slide just I have a given you that is during roasting like baking process or roasting process di-heating process, how different components like amino different amino acids in different products in different foods. They contribute to the formation of characteristic aroma are flavour that is in the may be through mallard reaction or to the interaction with sugar.

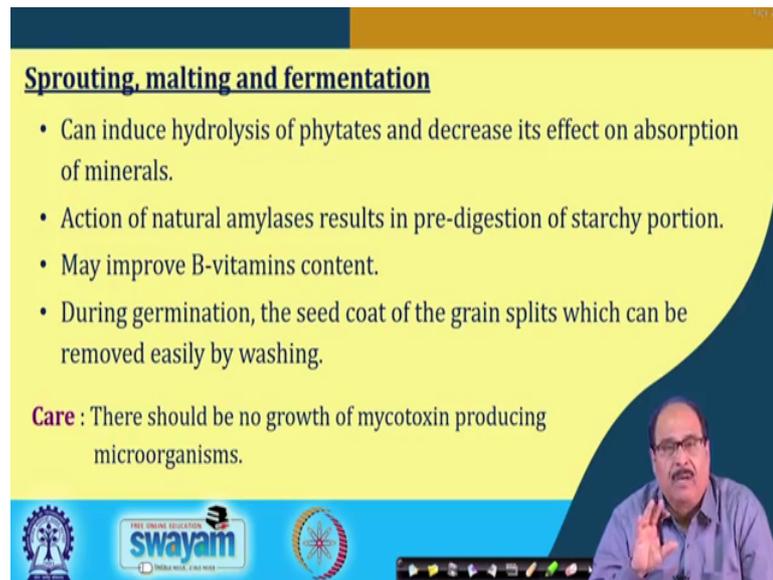
For example, in the case of potato infect amino butyric acid, a it reacts with sugar and give rise to the characteristic caramel flavour or nutty flavour also similarly in the peanut in the cocoa bean these are the different enzymes and their contribution to the characteristic flavour development is provided in this table you can go through it.

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Sprouting, malting and fermentation

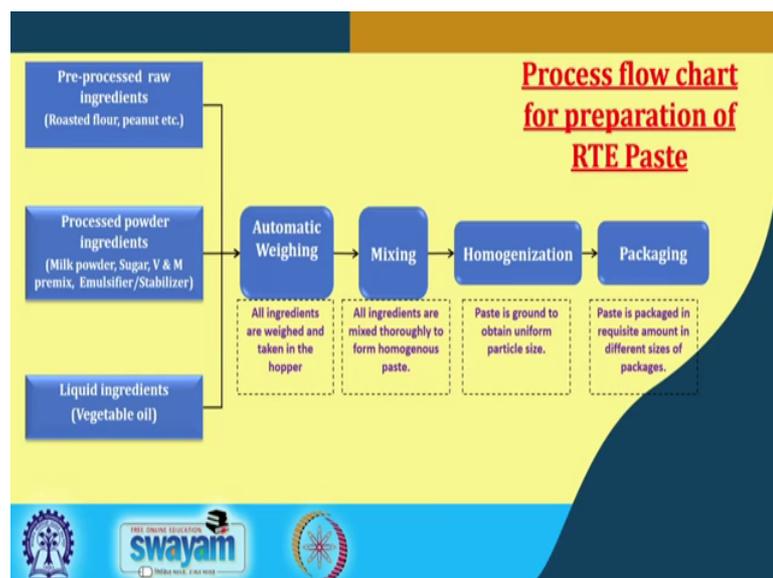
- Can induce hydrolysis of phytates and decrease its effect on absorption of minerals.
- Action of natural amylases results in pre-digestion of starchy portion.
- May improve B-vitamins content.
- During germination, the seed coat of the grain splits which can be removed easily by washing.

Care : There should be no growth of mycotoxin producing microorganisms.



Then a sprouting, malting and fermentation or the other process some time they can this is sprouting particularly a malting can induce hydrolysis of phytates and decrease its effect on absorption of minerals. Action of natural enzymes result in pre-digestion of a starch protein, it may improve the vitamins content during germination, the seed coat of the grain is splits which can be easily removed by de husking etcetera. So, depending upon again the raw material are ingredients etcetera this process also can be adopted.

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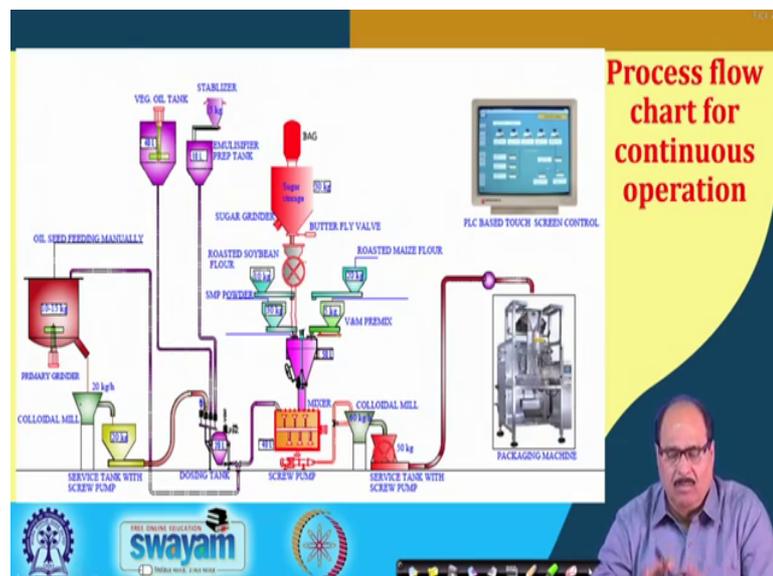


So, here in this I have given you a process flowchart for the preparation of ready to eat food paste there are process pre-process raw ingredients like roasted floor, peanut etcetera, then processed ingredients like milk powder, sugar, vitamin mineral premix, emulsifier stabilizers and liquid ingredient vegetable oil.

So, we have three groups of ingredients, first pre-process are treated raw materials then process ingredients and the third group is the liquid ingredient. So, they; obviously, using appropriate a metering unit and weighing unit they should be weighed and for the formulation.

And then the next step in the mixing, that is may be first solid mixing all the solid in grade ingredients may be mixed together and then a liquid and solid may be mixed separately using another suitable equipment and then you get a type of paste and this paste should be homogenised that is the particle size etcetera, should be using colloidal mill or such other systems. It may be made ensure that all the particle size of all the materials are of almost similar as type or similar nature or similar sizes. So, that it ultimately the paste is a homogeneous is smooth paste. And then the last step is the packaging in appropriate packets are such.

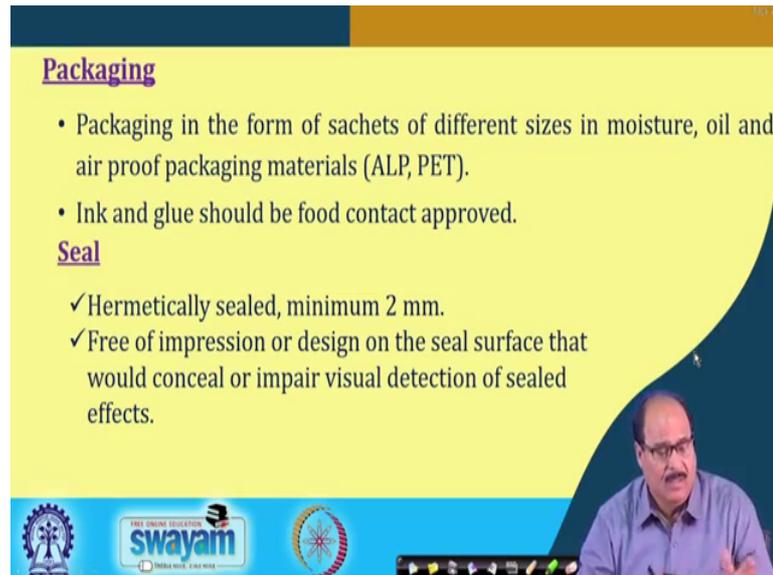
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So, this gives a schematic or operation wise process flow chart for the preparation of the material, you can see here that is in this where there is a seen the tank, where that is the it is a primary grinder, it says that this bit oilseed mix that is oilseed and oil roasted a this

peanut oil etcetera are added then in the solid ingredients. So, liquid ingredients are milled here you get that through the with the help of dozing tank, that is the liquid and this solid ingredients they are by appropriate in a mix in the, then further they are liquid and solid they are mixed together and through colloidal mill homogenisation and finally, they are send to the packaging unit.

(Refer Slide Time: 29:37)



Packaging

- Packaging in the form of sachets of different sizes in moisture, oil and air proof packaging materials (ALP, PET).
- Ink and glue should be food contact approved.

Seal

- ✓ Hermetically sealed, minimum 2 mm.
- ✓ Free of impression or design on the seal surface that would conceal or impair visual detection of sealed effects.

The slide also features logos for 'swayam' and 'INDIA RISE, INDIA RISE' at the bottom, and a small inset image of a man in a blue shirt presenting.

So, the same operations then the packaging; normally, it is done in the form of sachets of different sizes in moisture oil and air proof packaging material because that is very important. This packets should it should be totally impermeable to air or moisture or also it should be electrolyte etcetera.

So, that the oxidation and other reactions can be prevented, a normally ALP PET are considered suitable material for the packaging of this such type product also ink and glue, which is used it should be food contact approved that is because there it may contact it should be grass material and it should be approved by regulatory agencies for use in food packet etcetera.

The seal proper sealing is very very important it should not be leaking, it should be hermetically sealed and sealing should be at least minimum 2 mm to make sure that there is no chance of access of a entry of a air etcetera and it is free of impression or design on the seal surface that would conceal or impair visual detection of the seal effects.

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Labeling

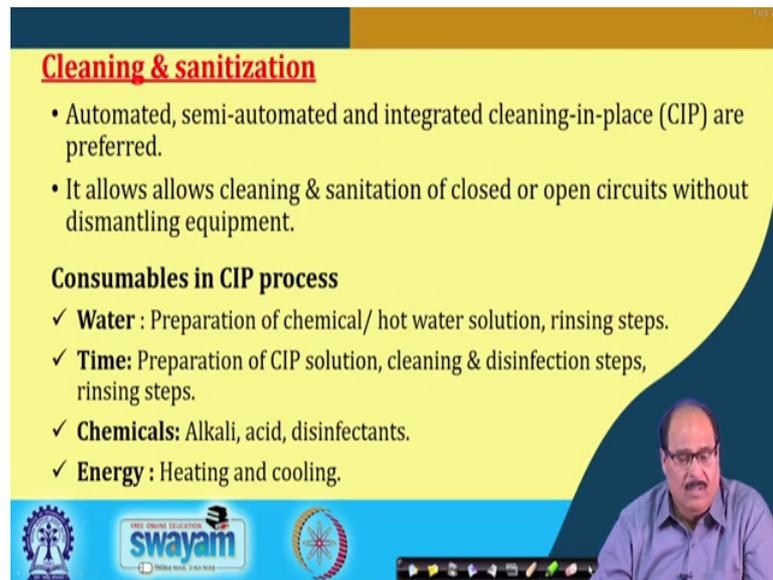
- Labeling should conform to the existing regulations. In general, following information should be clearly printed on the label.
 - ✓ Product generic name
 - ✓ Raw materials (listed in order of descending quantities)
 - ✓ Clear pictorial instructions
 - ✓ Manufacturing date
 - ✓ Best before date
 - ✓ Batch/lot number
 - ✓ Storage conditions
- A leaflet should be included in each carton with detailed nutritional composition of the product, including composition of the mineral and vitamin premix.

The slide features a yellow background with a dark blue curved shape on the right side. At the bottom, there are logos for 'swayam' and 'THE ONLINE EDUCATION' along with a circular emblem.

Finally after packing the packing made then the labelling becomes very very important it should be then there is the proper information about the ingredients should be provided on the label and this whatever what information should be provided that are governed under regulatory agencies in different country.

So, the labelling should confirm to the existing regulations of the nation in which the food is prepared in which the food to be consumed. In general, the information that are clearly printed on the label include product generic name, raw materials that is it should be all the raw materials should be listed in the order of descending quantities. Clear pictorial instructions, manufacturing date, best before date, batch or lot number, storage conditions etcetera. And possible that is required a leaflet containing all the information that is detailed composition of the product including composition of the vitamins and minerals premix storage instructions used instruction etcetera should be provided in the packet in the carton.

(Refer Slide Time: 32:26)



Cleaning & sanitization

- Automated, semi-automated and integrated cleaning-in-place (CIP) are preferred.
- It allows cleaning & sanitation of closed or open circuits without dismantling equipment.

Consumables in CIP process

- ✓ **Water** : Preparation of chemical/ hot water solution, rinsing steps.
- ✓ **Time**: Preparation of CIP solution, cleaning & disinfection steps, rinsing steps.
- ✓ **Chemicals**: Alkali, acid, disinfectants.
- ✓ **Energy** : Heating and cooling.

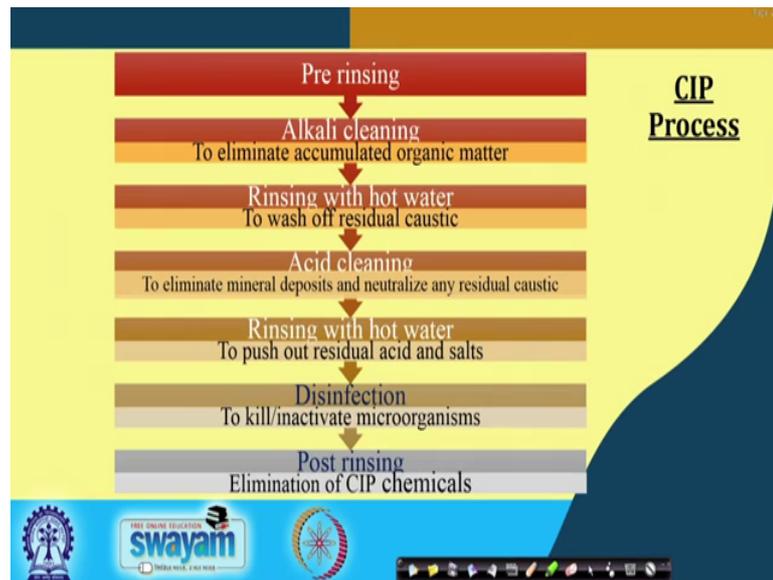
The slide also features logos for 'swayam' and 'INDIA WISE, LEAD WISE' at the bottom, along with a small video inset of a man in a blue shirt speaking.

Then cleaning and sanitization another important aspect that is automated, semi-automated and integrated CIP systems should be used in such product manufacturing units, because this CIP system allows the cleaning and sanitization of the closed or even open circuits without dismantle in the equipments.

In the CIP system different consumables are water that is the which is used for preparation of chemical, may be hot water solution or solution required for rinsing steps, then it may time because preparation of the CIP solution, this disinfection steps, rinsing steps that is for how long what, up to what time this cleaning should be done. And that is the time should be given for interaction of the detergent solution or cleaning or sanitizing solution for removal of any tightly and (Refer Time: 33:29) ingredients inside the pipe joints etcetera. Then chemicals like alkali, acid, disinfectants etcetera are should be there.

And finally, energy for heating and cooling because in such food you have seen that is some oil containing material, protein containing material or all sorts of materials are used then all the equipments etcetera there should be used by acid cleaning, alkali cleaning and this hot water cleaning, air dry air and contamination free air and finally, some sanitizer should be used to make sure that the equipments are properly.

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Before in between the batch before one after one batch produced and before the next batch all the equipment etcetera is. So, pre rinsing, alkali cleaning, rinsing with hot water then acid cleaning because acid cleaning; so that there is any alkali etcetera is rader in. So, by acid it is neutralized, then rinsing with again hot water for every cleaning, acid cleaning hot water, that after alkali cleaning hot water, after acid cleaning hot water treatment so that all the acid etcetera are also removed.

Then finally, using appropriate sanitization, equipment disinfected and then after disinfection of the equipment and in etcetera, then final is the poster rinsing may be done by hot water or hot air dry air steam etcetera. So, all there are standards and procedure for these things that is it must be the important thing is that, all necessary care should be taken to make sure, that the equipment, there inner, outside and is to everything is properly clean.

(Refer Slide Time: 35:17)

Safety

- The RTE food paste should be free from any objectionable matter.
- It must not contain any toxic substance originating from microorganisms or any other poisonous or deleterious substances including antinutritional factors, heavy metals or pesticides.

Maximum levels of objectionable content in RTE Paste

Aflatoxin	level 5 ppb maximum
Micro organism content	10,000/g maximum
Coliform test	negative in 1g
Clostridium perfringens	negative in 1g
Yeast	maximum 10 in 1g
Moulds	maximum 50 in 1g
Pathogenic Staphylococci	negative in 1g
Salmonella	negative in 125g
Listeria	negative in 25g



And then safety, the maximum the ready to eat food paste should be free from any objectionable matter and it must not contain any toxic substance originating from microorganisms or any other provisions or even it should not be containing any poisonous substances or deleterious substances including anti nutritional factors, heavy metals or pesticides etcetera.

And in this table there is this different maximum labels of permissible labels are up to maximum which can be the different objects, enable materials etcetera which a tolerable limit of there is given like alfatoxin, maximum 5 PPB can be tolerated otherwise, beyond that it should not. Similarly, microorganisms contains CFU, coliform test etcetera are provided in this table.

So, starting from the beginning till the end process in the factory, in the storage material etcetera are good manufacturing practises, good hygienic practises etcetera should be all properly followed to make sure that the product be safe for this consumption.

Thank you.