

ST ANDREWS SCOTS SR. SEC. SCHOOL
I. P EXTENSION , PATPARGANJ, DELHI - 92
CLASS IX
SUBJECT: BIOLOGY
NOTES: LESSON 15- IMPROVEMENT IN FOOD RESOURCES (PART -1)

Introduction

All living organisms essentially require the food to stay alive.

Food provides energy to perform various life activities and is required for growth, development and body repair.

Food

Food supplies all the basic requirements, which are required for growth, development, and proper health. Food is a mixture of all nutrients, including the carbohydrates, fats, proteins, vitamins and minerals.

Sources of Food:

1. Food from agriculture: Cereals, pulses, vegetables, fruits, nuts, oilseeds, condiments and spices
2. Food from animal husbandry: Dairly products like milk, curd, butter; meat, egg, fish and other sea products.

Food Revolutions in India

With the increase in population, there needed a sufficient increase in food production, so as to meet the food related demands of growing population. This led to the rise of the following food revolutions in India:

1. **Green Revolution:** Introduced to increase the food grain production.
2. **White Revolution:** Introduced to increase production of milk.
3. **Blue Revolution:** Introduced to enhance fish production.
4. **Yellow Revolution:** Introduced to increase oil production.

These revolutions means that are natural resources are getting used more intensively. As a result there are more chances of causing damage to our natural resources to the point of destroying their balance completely. Therefore, it is important that we should increase food production without degrading our environment and disturbing the balances maintaining it. This practice in agriculture is known as **sustainable agriculture**.

Improvement in Crop Yields

Different types of crops and their Nutritional Value

<i>Crop</i>	<i>Examples</i>	<i>Value</i>
<i>Cereals</i>	<i>Wheat, rice, maize, millets, sorghum</i>	<i>Carbohydrates</i>
<i>Pulses</i>	<i>Gram, black gram, green gram, pigeon pea, lentil</i>	<i>Proteins</i>
<i>Oilseeds</i>	<i>Soybean, groundnut, sesame, castor, mustard, sunflower</i>	<i>Fats</i>
<i>Vegetables, Spices and Fruits</i>	<i>Carrot, Cinnamon, orange, spinach</i>	<i>Minerals, vitamins and small amounts of Carbohydrates, fats and proteins</i>
<i>Fodder crops</i>	<i>Berseem, oats, sudan grass</i>	<i>Food for Livestock</i>

Sources of carbohydrate

Carbohydrates can be found in different forms, such as sugars, fresh fruits, starch, vegetables, cereals, corn, potatoes, fibres, bread, pastries, milk and milk products.

Sources of fats

The fats are obtained naturally in several foods, such as butter, cheese, cream, and in oilseeds including soybean, groundnut, etc.

Sources of vitamins and minerals

Vegetables and fruits are the main sources of vitamins and minerals. Some of the vitamins can also be obtained by meat and fish.

Sources of protein

The most common food which has a higher amount of protein are chicken, egg, fish, almond, chicken, oats, seafood, soy, beans, pulses, cottage cheese, Greek yoghurt, milk, broccoli, and quinoa.

Fodder crops

Fodder crops like berseem, oats or sudangrass are raised as food for the livestock.

Different crops grow in different Seasons because they require a particular climate temperature and photoperiod for their growth.

(Photoperiod is a period of light that is required for growth of a plant)

Kharif crops

The crops which are grown during the monsoon (June to October) are called Kharif crops. Black gram, cotton, green gram, maize, paddy, pigeon pea, soybean, are all examples of Kharif crops.

Rabi crops

Crops which are grown during the winter season(October-March) are called Rabi crops. Wheat, gram, peas, mustard, linseed are rabi crops.

<i>Crop</i>	<i>Season</i>	<i>Example</i>
<i>Kharif</i>	<i>Rainy (June to October)</i>	<i>Rice, maize, millets</i>
<i>Rabi</i>	<i>Winter (November to April)</i>	<i>Soybean, pigeon pea, wheat</i>

Activities that lead to improvement in the crop yield:

The major group of activities for improving crop yields can be categories as follows :

1. Crop variety improvement.
2. Crop production improvement.
3. Crop protection improvement.

Crop Variety Improvement

Varieties or strains of crops can be selected by breeding for various useful characteristics such as disease resistance, response to fertilisers, product quality and high yields. This is called crop variety improvement.

Hybridization

The crossing of genetically dissimilar plants is referred to as hybridization. Hybridization may take place between different varieties(intervarietal), between two different species of the same genus(interspecific) or between different genera (intergeneric).

Hybridisation refers to crossing between genetically dissimilar plants.

Intervarietal hybridisation

It is a cross between the two same species but different varieties.

Interspecific hybridisation

It is a cross between the two different species but the same genera.

Intergeneric hybridisation

It is a cross between the two intergeneric hybridizations belonging to different genera.

Genetically modified crops

A desirable gene when added to the genome of a crop, we get genetically modified crops.

Examples of genetically modified crops or GM crops are Bt cotton, Bt brinjal, golden rice, etc.

Factors for which variety improvement is done

There are several reasons for which different improved varieties of crops are generated. The reasons include:

1. Higher yield.
2. Improved quality.
3. Maturity duration.
4. Wider adaptability.
5. Biotic and abiotic resistance.
6. Desirable agronomic characteristics.

The variety improvement is done for the following reasons.

Higher yield: Crop variety improvement's main goal is to increase the productivity of the crop. To develop high yielding variety.

Quality product: To improve the quality of the food crops. The quality of the crop depends on the type of crop. Considering the pulses and grains, they must have better baking quality. Oil crops should give quality oil.

Resistance: To develop resistance to both living and non-living factors. Biotic factors like insects, parasites, diseases, etc. and abiotic factors like hot, cold, drought, salinity, etc. affect crop production. Resistant variety can withstand these factors and give a high yield.

Maturity period: To shorten and to develop uniform maturity period. The short maturity period of crops helps farmers in multiple rounds of cultivation in less expenditure during a short period. Also, the uniform maturity of crops helps in easy harvesting. Thus, the overall variety of improvement makes the situation more profitable.

Adaptation: To develop tolerance and make crops more adaptable to different conditions. The crops can be grown even in diverse conditions. For example, crops with tolerance to high salinity soil.

Desirable agronomic characteristics: To develop desired agronomic characters in crops. This helps in a higher yield in less expenditure. For example, dwarfness in cereals reduces the nutrient consumption without affecting the yield.

Crop Production Improvement

Crop production management is the processes that are used to effectively cultivate and harvest crops.

Nutrient management

A plant gets its nutrients from air, water and soil. There are sixteen nutrients which are essential for plants. Air supplies carbon and oxygen, hydrogen comes from water, and soil supplies the other thirteen nutrients to plants. Nutrient management is done by supplying the soil with required nutrients, by adding fertilizers and manures.

Macronutrients

Among the 13 essential nutrients, 6 are the most essential nutrients required in abundance for growth and development of plants. These essential nutrients are collectively called macronutrients or major elements.

Nitrogen (N), Phosphorus (P), Potassium (K), Calcium (Ca), Sulphur (S), Magnesium are the list of macronutrients required by the plants.

Micronutrients

Among the 13 essential nutrients, 6 are classified into macronutrients and other 7 are classified into micronutrients or minor elements or trace elements.

These type of nutrients include iron (Fe), boron (B), chlorine (Cl), manganese (Mn), zinc (Zn), copper (Cu) and molybdenum (Mo). They are required in very small quantities, therefore, they are also called as trace minerals.

These nutrients are supplied to plants by air, water and soil.

Sources	Nutrients
Air	Carbon. oxygen,
Water	Hydrogen, oxygen
Soil	1. Macronutrients: nitrogen, phosphorus, potassium, calcium, magnesium, sulphur. 2. Micronutrients: iron, manganese, boron, zinc, copper, molybdenum, chlorine

Manure

Manure is an organic matter obtained from the solid wastes of animal, humans, sludge, sewage, domestic waste, decomposed dead plants and animals and other plant wastes including dry leaves twigs, agricultural wastes, weeds, etc. It contains a huge quantity of nutrients, which improves the soil quality and increase the yield of healthy crops.

Compost and vermicompost

The process in which the biological waste material is decomposed in pits is known as composting. When compost is prepared by using earthworms to hasten the process it's called vermicompost.

Green manure

Prior to the sowing of the crop seeds, some plants like sun hemp or guar are grown and then mulched by ploughing them into the soil. These green plants thus turn into green manure which helps in enriching the soil nutrients.

Fertilizers

Fertilizers are commercially produced plant nutrients, which are required in small quantities. There are various brands of this fertilizer are available in the market. A most common example of fertilizer is NPK fertilizer which provides nitrogen, phosphorus and potassium.

Organic farming

Organic farming is a farming system with minimal or no use of chemicals as fertilizers and with a maximum input of organic manures. All resources are used optimally to get maximum, chemical-free yield.

How are fertilizers and manure different?

Manure	Fertilizers
Manure provides humus to the soil	Fertilizers do not provide humus to the soil
Manures are less rich in nutrients	Fertilizers are highly rich in nutrients
Long term usage of manure leads to increment in the fertility of the soil	Long term usage of fertilizers can lead to decrease in the soil fertility
Manures are insoluble in water	Fertilizers are soluble in water
These are organic substances	These are inorganic substances

Irrigation

Irrigation is the artificial process of applying water to the crops to fulfil their water requirements. There are different types of irrigation practised for improving crop yield. This process helps in ensuring that the crops get water at the right stages .i.e. during their growing season, which helps in increasing the expected yields of crop. Irrigation is done with the help of Canals, Wells, River lift system, Tanks, Rainwater harvesting and watersheds.

The irrigation or water requirement of crops depends on the -

1. Nature of crops (i.e.crop based irrigation)
2. Nature of soil, (I.e. soil based irrigation)

Cropping pattern

Cropping pattern refers to the proportion of area under various crops. The three types of cropping pattern are:

Mixed cropping: It refers to a cropping system where two or more crops cultivated in the same piece of land simultaneously. This technique is most commonly followed by farmers as it reduces the risk of total crop failure because of less rainfall or adverse climatic conditions.

Advantages of Mixed Cropping

1. The crop yield increases.
2. The pest infestation is minimized.
3. Reduction in the risk of crop failure.
4. The soil is utilized properly.
5. More than one variety of crops can be harvested at the same time



Intercropping: It is a cropping technique in which two or more crops are cultivated simultaneously in the same piece of land adhering to a specific row pattern. This type of cropping pattern helps in increasing the productivity of the crops. Therefore, it is followed by small farmers who are completely dependent on the rainfall for better yield.

Advantages of Intercropping

1. The fertility of the soil is maintained.
2. The spread of diseases and pests is controlled.
3. Optimum utilization of resources.
4. The space and time of growing more than one crop are saved.
5. Maximum utilization of nutrients present in the soil.

Maize and soybean, bajra and lobelia are some of the crops grown as intercrops.



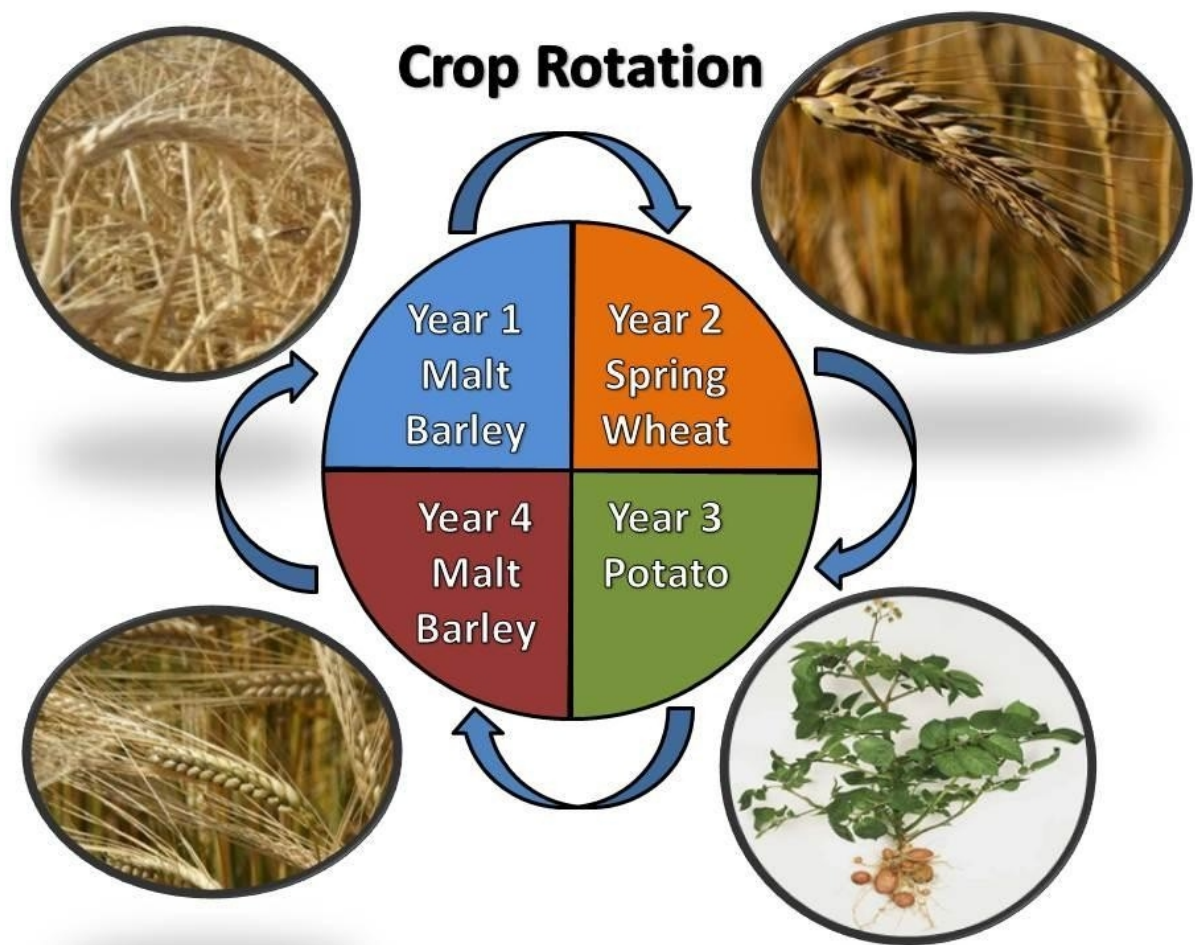
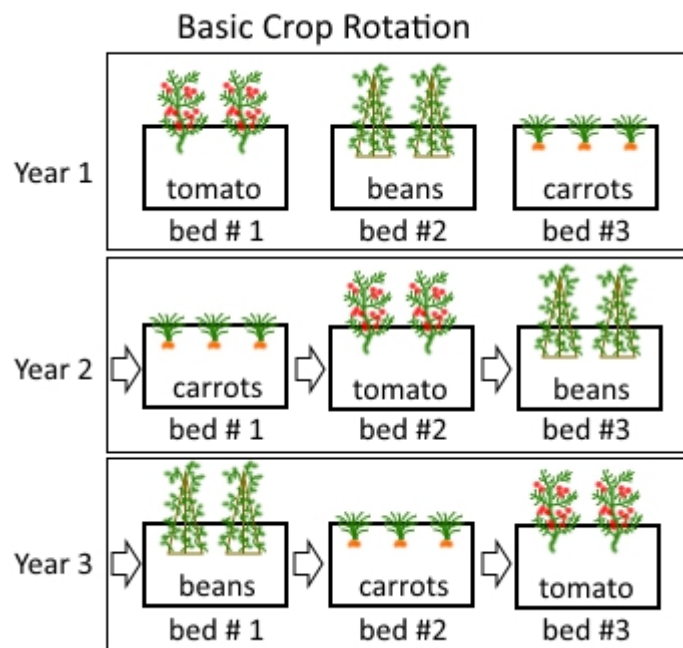
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Crop Rotation: It is a cropping technique, which is practised for growing different crops on the same land in preplanned succession. The crops are selected based upon their duration- on the one-year rotation, two-year rotation, and three-year rotation.

Advantages of Crop Rotation

1. The soil fertility is maintained for a prolonged period.
2. The growth of weeds and pests is prevented.

3. A lot of chemical fertilizers are not required.
4. The physical and chemical nature of the soil remains unaltered.



Crop Protection Management

Field crops are infested by a large number of weeds, insect, pests and diseases from which the crops should be protected.

Weeds

Weeds are unwanted plants in the cultivated field consuming all the soil nutrients finally reducing the crop yield.

Protection methods against weeds

To protect the crop against weed, the following methods are employed.

1. Preparing a good seedbed.
2. Mechanical removal of weeds.
3. Plants the seeds in a timely fashion.

Weedicides : The chemical substances used to remove weeds are known as weedicides.

For example - Atrazine, 2,4 Dichlorophenoxy acetic acid etc.

Effects of Insects and Pests on crops

Insect pests attack the plants in the following ways :

1. They cut the root, stem and leaves of the plants
2. They suck the cell sap from various parts of the plant.
3. They bore into stem and fruits resulting in the reduction in yields.

Pesticides and Insecticides

Pesticides and insecticides are chemicals that are used to kill or destroy the pests and other insects that cause extensive damages to the stored and freshly harvested crops. These chemicals are basically toxic in nature. For example - Boric acid, Malathion etc.

Fungi and Viruses

Fungi and viruses are diseases causing harmful microorganisms, which affects both the plants and newly yield crops. These pathogens are destructive, as they destroy huge farms of crops.

Few examples of plant viruses are tobacco mosaic virus, cauliflower mosaic virus, cucumber mosaic virus etc. Disease-causing fungi are leaf rust, stem rust, powdery mildew etc.

Herbicides and Fungicides

They are highly toxic chemicals that are used to kill fungus and unwanted vegetations.

Storage of Grains :

There is a need of safe and proper storage of grains. The storage of grains are of two types.

1. **Dry storage**- The grains are stored at room temperature .This method is used to store wheat ,rice, sugar etc.
2. **Cold storage** - The fruits and vegetables are stored by this method.

Storage losses

After harvesting, the newly obtained food grains are stored in huge storage facilities such as silos. However, due to the attack from pests or waterlogging, the food grains get destroyed. This is called storage loss.

Factors affecting storage loss

The factors affecting the storage loss include both Abiotic and Biotic factors. Listed below are few of them:

1. **Biotic Factors:**Storage losses due to living organisms such as insects, rodents, fungi, mites and bacteria are biotic factors.
2. **Abiotic Factors:**Losses due to non- living organisms such as moisture and temperatures in the place of storage is called abiotic factors of storage loss.

Prevention and control measures for storage loss

Storage loss can be prevented by following certain protocols like:

1. Strict cleaning of the produce before storage.
2. Fumigation using chemicals that can kill pests.
3. Proper drying of the product first in sunlight and then in shade.