

VEGETABLES AND FRUITS

Vegetables and fruits are nature's marvellous gift to the humankind. Vegetables and fruits are very important commodities in our daily diet. They are life-enhancing medicines packed with vitamins, minerals, antioxidants and many phytonutrients (Plant-derived micronutrients). Vegetables and fruits are available throughout the year and they can be consumed fresh and eaten raw. They are an absolute feast to our sight because of their colour and have a unique nutrient profile that helps the human body to be fit, rejuvenate, and free of diseases.

In this lesson, the students will be able to:

- recognise and classify the various types of vegetables and fruits.

- be familiar with the composition and nutritive value of Vegetables and fruits



- understand the causes and ways to prevent browning in vegetables and fruits
- know how to conserve nutrients while cooking vegetables
- understand the importance of eating vegetables and fruits every day
- learn exciting ways to add more vegetables and fruits to their daily diet

All vegetables and fruits are plants or parts of plants that are used as food. Different parts of plants are consumed.



Vegetables and fruits

3.1 Composition of vegetables and fruits

Vegetables contain a high amount of water. They also contain carbohydrates, dietary fibre, protein, vitamins and other nutrients that are important for human health.

Lettuce, cucumbers and leafy vegetables contain about 95% water, therefore only 5% of their mass is dry matter. Hard vegetables like carrot and pumpkin have around 12-15% dry matter.

Carbohydrates are the main components of vegetables and fruit. They represent more than 90% of their dry matter. Carbohydrates are present as starch, sugars and dietary fibre. Starch is mainly found in root vegetables, such as potatoes and sweet potatoes.

The main sugars that are present in vegetables and fruits are glucose, sucrose and fructose. Although more usually

associated with fruit, sugars are an important component of flavour in vegetables such as carrots, sweet corn and peas.

Dietary fibre compounds like cellulose, lignin, pectins and other substances are also found in vegetables and fruits. Dietary fibre in vegetables and fruits have several health benefits like lowering blood sugar and cholesterol levels.

3.2 Classification of Vegetables

Vegetables are classified according to the part of the plant consumed, colour of the vegetable or according to the nutritive value.

3.3 Nutritive value of vegetables

- Roots and tubers like carrots, potatoes and sweet potatoes contain a large amount of starch (carbohydrates), hence they contribute to energy value of the food.

Table 3.1 Classification of vegetables based on parts of plants consumed

Parts of plants	Examples
Roots	Carrot, beet root, radish, turnip, colocasia
Tubers	Potatoes, sweet potatoes, tapioca
Bulb	Onion, garlic, leeks
Leaves	Cabbage, lettuce, spinach, amaranth, fenugreek leaves, coriander leaves, mint leaves, greens
Flowers	Plantain flower, cauliflower, broccoli
Fruits	Tomatoes, brinjal, lady's finger, pumpkin, cucumber, gourds (ash gourd, bottle gourd), capsicum, drumstick, plantain
Legumes (pods and seeds)	Peas, beans, chowli, broad beans, French beans, double beans, Bengal gram tender, red gram tender.
Stems	Plantain stem, ginger, amaranth stem, celery stem, lotus stem and greens

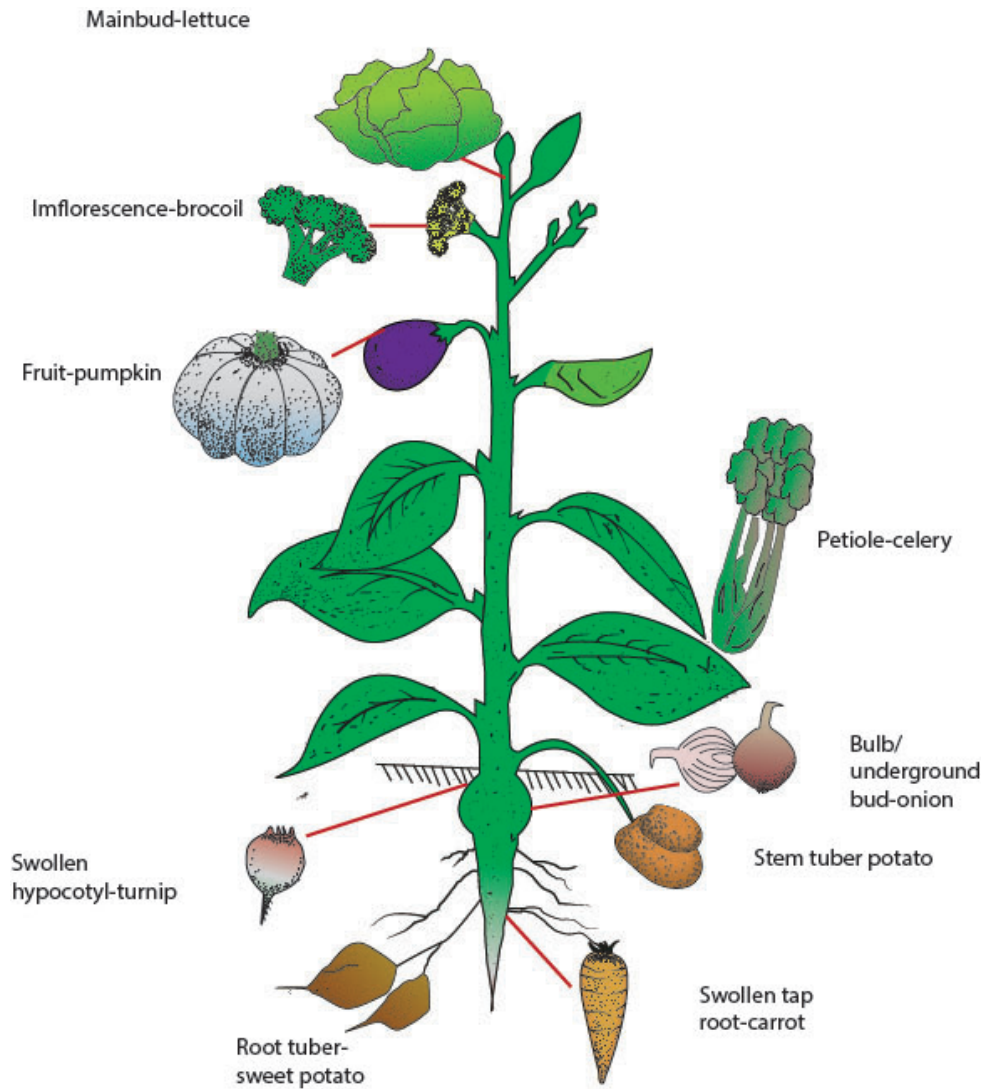


Fig 3.1: Origin of vegetables from different plant parts

- Carrots contain a large amount of Beta carotene (Vitamin A). Potatoes and sweet potatoes are rich in Vitamin B₆, Vitamin C, Potassium and Iron.
- Green leafy vegetables are good sources of phosphorus, calcium and iron. They are excellent sources of carotene (Vitamin A) which are also good antioxidants.
- Greens are good sources of vitamin-B particularly riboflavin and folic acid. But drying and withering reduce vitamin-B.
- Green leafy vegetables also contain vitamin-C eg., Agathi, drumstick leaves and coriander leaves.
- Green leafy vegetables are rich in iron. Eg., Mint leaves, drumstick leaves, paruppukeerai.
- Agathi, colocasia leaves, drumstick leaves and fenugreek leaves contribute to calcium in our diet.
- Greens are good sources of fibre which help in preventing degenerative diseases.





- Beans and peas are high in fibre. Fiber increases stool bulk and prevents constipation.
- Beans, peas, and lentils are also rich sources of some vitamins and minerals, such as folate, iron, potassium and magnesium. Folate and iron are important for preventing anaemia, as well as maintaining normal metabolic functions. Potassium and magnesium are important for muscle and nerve function.

DO YOU KNOW...?



Spinach is the leaf, cauliflower is the flower and cucumber is the fruit. Some plants have medicinal value.

free from flowers, insects, mud and spots or holes in the leaves.

While selecting roots and tubers ensure that they are heavy, firm, free from sprouts, heavy in relation to size, with shallow eyes and without green discolouration.

At the peak of season, each vegetable and fruit has the highest nutrient content, flavour and is available at a reasonable price. It is therefore, advisable to buy vegetables and fruits which are in season, as the quality is good and the price is low.



ACTIVITY - 1

Visit a local market and indicate how you will purchase any five vegetables and fruits

3.4 Purchase of vegetables and fruits

Most fresh vegetables and fruits retain their freshness for a short time under ideal conditions of storage. They belong to the category of perishables (green leafy vegetables) and semi - perishables (garlic, onion, roots and tubers) In general, freshness, uniformity of size, colour, degree of ripeness and being free from defects are the qualities most sought after while purchasing vegetables and fruits.

When purchasing, select fresh vegetables which are firm, crisp, bright in colour with no visible bruises or signs of decay and wilting.

Select clean leafy vegetables which are fresh, tender, crisp, brightly coloured and

3.5 Vegetable Cookery

Vegetables are cooked to improve the colour, flavour and texture by which overall palatability is improved. Digestibility is also improved. The fibre becomes softened, starch gets gelatinised and protein gets coagulated. Cooking vegetables adds variety to the diet. Cooking also destroys micro-organisms.

While cooking vegetables, water-soluble nutrients like thiamine, riboflavin, nicotinic acid, pantothenic acid, pyridoxine, folic acid and vitamin C may be dissolved in the cooking water and the nutrients may be lost.

3.5.1 Methods to reduce loss of nutrient while cooking vegetables



Table 3.2 Methods to reduce loss of nutrients while cooking vegetables.

Action	Reason
Cut the vegetable into bigger pieces.	Exposure of the vitamins to water is less.
Cut the vegetables and use it immediately.	Vitamin C is lost on exposure to air.
Soaking or washing time should be reduced. Wash the vegetable with the skin and later should be peeled and cut.	Enough time is not given for the water soluble nutrients to get dissolved in water.
Vegetables should be cooked in minimum amount of water. Any liquid remaining after cooking the vegetable should be used in a gravy or soup.	Water soluble nutrients are lost in the cooking liquid.
Cook vegetables wherever possible with the skin.	Leaching of vitamins into the water would be less.
Cook the vegetables by steaming and pressure cooking.	No additional water is added.
Do not add sodium bicarbonate while cooking	Nutrients are destroyed in an alkaline medium.
Cook for a minimum time, using a tight fitting lid.	Prolonged heating increases vitamin loss.
Green leafy vegetables should be washed well and then cut.	Water soluble nutrients are lost if the the vegetables are washed after cutting them
Greens should be cooked in open pans.	Greens when cooked in closed pans lose the natural green colour.



3.5.2 Role of vegetables in cookery

Vegetables are used universally in all recipes. They are used

- in curries, salads and in sambar
- as garnishing agents eg. shredded carrot and coriander leaves
- as stuffing in samosa and parathas
- as thickening agents in gravies and soups
- in chutneys (onion) and pickles (tomato, onion)
- as part of recipes like pulao, avial and non-vegetarian dishes
- as preserved foods like vathal in the dehydrated form.





ACTIVITY - 2

- Make a chart to show the availability of seasonal fruits in your area.

3.6 Fruits

Fruits are formed from flowers and they are the ripened ovary or ovaries of a flowering plant together with the adjacent tissues. Most fruits are fleshy and pulpy or juicy and are pleasantly sweet and have a distinct appealing flavour when ripe. Fruits provide several health benefits and eating the recommended amount of fruit every day can reduce the risk of chronic diseases.

3.6.1 Nutritive value of fruits

Fruits contain high amount of moisture, hence they are highly perishable. They are also good sources of fibre. Apples, pears, cherries, grapes and citrus fruits contain flavonoids which act as antioxidants.

Fruits particularly citrus varieties and guava are a good source of vitamin C. Gooseberry is the richest source of vitamin C.

Yellow fruits like mango and papaya contain β carotene. Banana is a good source of carbohydrate and energy. Fruits are a poor source of protein and fat with the exception of avocado.

Fruits also contain fibre and minerals such as sodium, potassium and magnesium. They are not a good source of calcium. Dry fruits and Seetha phal (custard apple) contribute appreciable amounts of iron.

3.6.2 Classification of fruits

Fruits can be classified as:

Berries: Strawberries, gooseberries, blackberries, raspberries, blueberries, cranberries

Citrus fruits: Sweet limes, oranges, tangerines, sour oranges, lime, lemon, grape fruit.

Drupes: Apricot, sweet cherry, peach, plums

Grapes: Green grapes, black grapes, seedless grapes

Melons: Musk melon, water melon

Pomes: Apples, pears

Tropical and Subtropical fruits: Gooseberry, avocado, banana, dates, guava, jack fruit, mango, jambu fruit, papaya, passion fruit, pineapple, pomegranate, sapota, Seetha phal (custard apple).

3.7 Pigments in vegetables and fruits

Vegetables and fruits are appealing because of their bright and variable colours which are due to pigments present in the plastids of plant cells. The chief pigments of vegetables and fruits can be classified as water soluble and fat soluble.

Fat soluble/ Lipophilic pigments	Water soluble/ Lipophobic pigments
Chlorophyll	Anthocyanin (red/blue/purple)
Carotenoids (red, orange and yellow)	Flavones & flavanols (yellow) Flavanals etc.

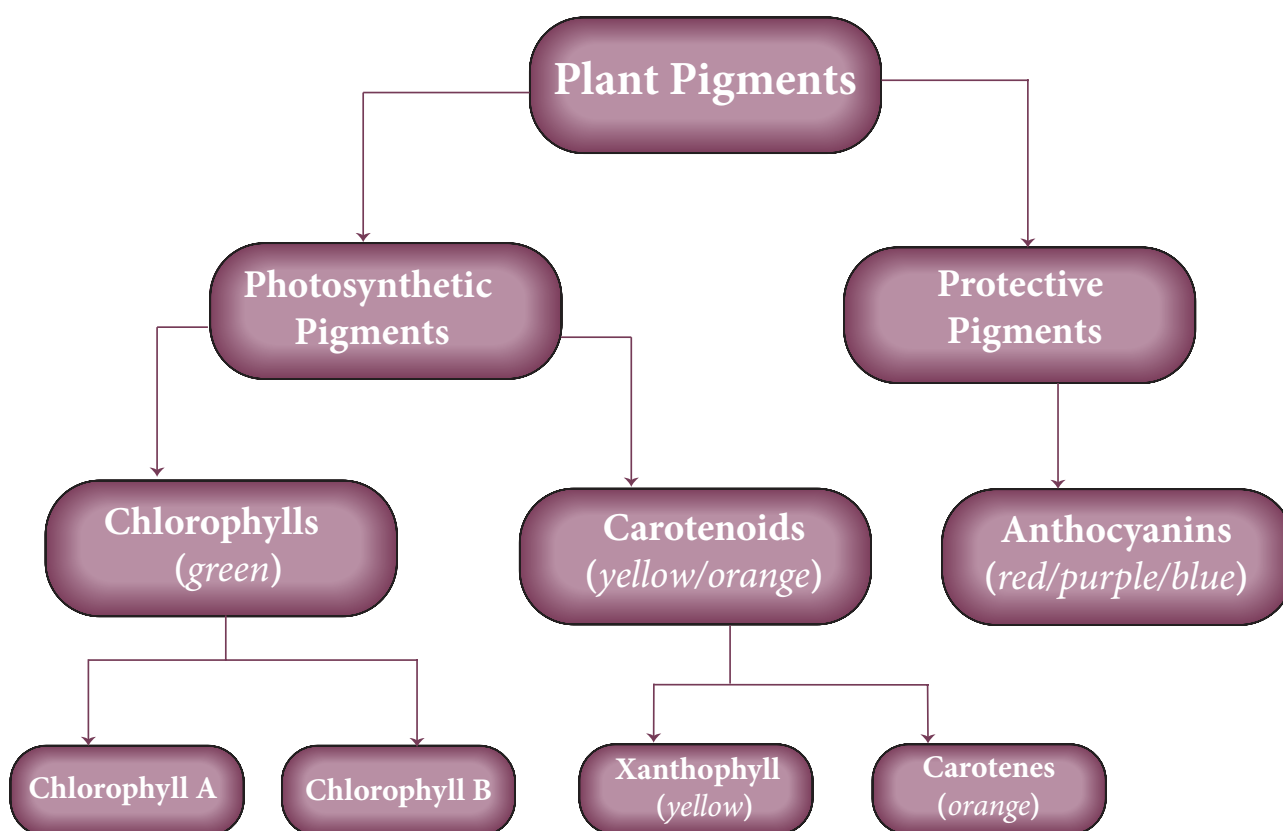


Fig 3.2: Classification of pigments in vegetables and fruits



ACTIVITY - 3

Cut pictures of vegetables and fruits from magazines and stick them on paper plates and highlight the nutrients present in each fruit and vegetable

Chlorophyll

Chlorophyll is the green pigment of leafy vegetables and other green coloured vegetables like capsicum, beans, peas and chillies. It is mostly insoluble in water. Two chlorophylls have been isolated. Chlorophyll-a is intense blue green in colour and chlorophyll-b is dull yellow green in colour.

Carotenoids

Carotenoids are the yellow, orange, red fat soluble pigments distributed in

nature. They are divided into three groups viz. carotenes present in carrot, green leafy vegetables and other fruits, lycopenes present in tomatoes and xanthophylls present in yellow fruits.

Pigments that contain the phenolic group include anthocyanin, anthoxanthin, leuco anthoxanthin, catechin, quinones and betalins. The first four groups are collectively known as “Flavanoids”.

Anthocyanin

They are a group of reddish water-soluble pigments occurring in many vegetables and fruits. Cherries, red apples, pomegranates have their colour appeal due to anthocyanins.



Anthoxanthins

They are colourless white to yellow pigments that give colour to cauliflower, onions, spinach or other leafy vegetables. In green leafy vegetables the colour is masked by chlorophyll.

3.8 Medicinal benefits of vegetables and fruits

Vegetables and fruits are an important component of our daily diet as man cannot live on cereals alone. Vegetables and fruits are essential for balanced diet and good health. They not only add colour and variety to the diet but also provide significant amounts of vitamins, minerals and carbohydrates including roughage (fibre). Vegetables and fruits also possess medicinal values.

The following list highlights some key nutritional benefits of vegetables and fruits:

- Vegetables and fruits are rich in fibre. Fibre gives satiety and thereby decreases food intake.
- Fibre is good for the heart and intestines. It helps in regulating bowel movement and helps to maintain a healthy digestive system and lowers the risk of bowel cancer.
- It reduces blood cholesterol levels and thereby helps in the prevention of cardio vascular diseases and lowers the risk of stroke.
- Folate in spinach, beans, melons and orange prevents neural tube problem at birth.
- Potassium in fruits and vegetables like sweet potatoes, tomato paste, tomato puree, beet greens, white potatoes, white beans, lima beans, cooked greens, carrot juice, and prune juice regulate blood pressure.
- Vitamin A keeps eyes and skin healthy and helps to protect against infections. Excellent fruit and vegetable sources of vitamin A are sweet potatoes, pumpkin, carrots, spinach, turnip greens, mustard greens, kale, collard greens, winter squash, cantaloupe and red peppers.
- Vitamin C helps to heal cuts and wounds, keeps teeth and gums healthy. Excellent fruit and vegetable sources of vitamin C are red and green peppers, kiwi, strawberries, sweet potatoes, kale, cantaloupe, broccoli, pineapple, Brussels sprouts, oranges and mangoes.
- Vegetables and fruits (with the exception of olives, avocados, and coconut) are naturally low in fat. Substituting vegetables and fruits for higher calorie foods should be a part of any weight loss program and healthy diet.
- Every fruit and vegetable offers different nutrients, taste and texture. For the best overall nutrition we have to choose a variety of vegetables and fruits.

3.8.1 Tips to increase the amount of vegetables and fruits in your diet

- Keep cleaned vegetables and fruits in the refrigerator so they are easy to grab as a quick snack
- Add vegetables to curries, stews and soups.

- Drink 100% fruit juice instead of fruit-flavoured drinks which contain added sugar.
- Have fruit for dessert.
- Keep a bowl of apples, bananas and/or oranges on the table for a quick snack.
- Choose a salad made with a variety of vegetables and fruits instead of junk foods like French fries.
- While baking cakes use raisins, dates or prunes. This helps to increase fibre.
- Add lettuce, onions, capsicum and/or tomatoes to sandwiches.
- Enjoy fruit smoothies or milk shakes for breakfast or snacks.
- Pack fresh or dried fruit for healthy snacks to school.



ACTIVITY - 3

Consider one type of fruit. Compare quality and price of fruit available in

- a) Small greengrocery shop,
- b) Supermarket, c) Wholesale market



3.8.2 Role of fruits in cookery

- Raw, whole or cut fruits can be served as an appetiser, as a salad or for dessert.
- Fruits can be served in the form of juices or milk shakes.
- Apples are served as stewed apples.
- Fresh fruits can be preserved as jams, marmalades, preserves and dried fruits



ACTIVITY - 4

Make a healthy raw snack with vegetables and fruits

3.9 Browning in vegetables and fruits

You might have seen apples, pears, potatoes and brinjal that turn brown in color when peeled or cut open. Have you ever thought about it? What is the reason behind this color change? That's because of a naturally occurring process called "Oxidation".

Enzymatic browning is an oxidative reaction responsible for browning in vegetables and fruits. When the skin of vegetables and fruits are either cut or broken, cell wall gets ruptured and an enzyme called polyphenol oxidase is released and reacts with the oxygen in the air. As a result vegetables and fruits turn brown or dark leading to changes in flavour and nutritional values.



Fig 3.4: Browning on cut surface of apple

5 a day

Eating a good variety of fruit and vegetables is an important element of healthy eating. The World Health Organisation (WHO) advises that we eat a minimum of 400g of fruit and veg every day, equating to five portions. This recommended daily amount is thought to help reduce risk of serious health conditions including stroke, heart disease, obesity and type 2 diabetes.

The 5 a day message looks to encourage people to enjoy a variety of different vegetables and fruits as part of a healthy balanced diet.

3.9.1 Measures to prevent enzymatic browning

There are ways to prevent fruits and vegetable from getting oxidized. Here are a few methods :

- Squeeze lime juice on fruits such as banana, apples, avocado, pears and vegetables like potatoes, sweet potatoes to prevent oxidative browning. The juice of other citrus fruits such as oranges and grape fruits can also be used.
- Soak the cut fruits or vegetables in plain water which helps to slow down the oxidation process.
- Blanching fruits or vegetables also prevents browning.
- Wrapping in a cling wrap tightly is also a good way to prevent browning.

- Most importantly, do not use a rusty knife as the iron in it will increase the rate of browning.

Summary

- Vegetables and fruits are essential for balanced diet and good health.
- They not only add colour and variety to the diet but also provide significant amounts of vitamins, minerals and carbohydrates including roughage (fibre).
- When purchasing, select fresh vegetables and fruits which are firm, crisp, bright in colour with no visible bruises or signs of decay and wilting.
- While cooking vegetables, water-soluble nutrients like thiamine, riboflavin, nicotinic acid, pantothenic acid, pyridoxine, folic acid and vitamin C may be dissolved in the cooking water and the nutrients may be lost. Hence care must be taken to adopt proper cooking techniques to prevent loss of nutrients.
- Vegetables and fruits are appealing because of their bright and variable colours which are due to pigments present in the plastids of plant cells.
- The chief pigments of vegetables and fruits are chlorophyll, anthocyanins, anthoxanthins and carotenoids.
- The cut surface of certain vegetables and fruits turn brown or dark due to enzymatic browning which can be prevented by blanching or by using lemon juice.

➤ Eating a variety of vegetables and fruits is an important element of

healthy eating and helps to reduce the risk of heart diseases and diabetes.

Glossary

Terms	Meaning
Cling wrap	A thin plastic film typically used for sealing food items in containers to keep them fresh over a longer period of time.
Pectin	Pectin is a soluble gelatinous polysaccharide which is present in ripe fruits and is used as a setting agent in jams and jellies.
Antioxidants	An antioxidant is a substance, such as vitamin E, vitamin C, or beta-carotene, thought to protect body cells from the damaging effects of oxidation
Phytonutrients	Phytonutrients are natural compounds found in plant foods such as vegetables, fruits, whole grain products and legumes. These plant compounds have beneficial effects working with other essential nutrients to promote good health
Brassica vegetables	Any plant belonging to the genus Brassica , of the mustard family. Examples include cabbage, kale, broccoli, cauliflower, turnip, and mustard
Dietary fibre	Also known as roughage. It is a portion of the plant that cannot be digested by the digestive enzymes.
Blanching	This refers to a cooking technique in which food is briefly immersed in boiling water. Blanching brings out the colour in vegetables and helps to maintain their nutritional value, which can be lost with overcooking.
Flavanoids	A large group of water-soluble plant pigments that are beneficial to health. Flavonoids are polyphenols and have antioxidant, anti-inflammatory, and antiviral properties.
Satiety	Satiety is a state of being completely full, more commonly used to describe someone who has eaten enough.

Questions

Part- A

Choose the correct answer (1 mark)

1. Green leafy vegetables are excellent sources of _____.

- a) protein
- b) vitamin and minerals

c) fat

d) Lactose

2. The _____ pigment present in beet root is _____.

- a) betalain
- b) allin





- c) curcumin
- d) carotenoids
- 3. The enzyme responsible for browning is _____.
 - a) polyphenol oxidase
 - b) thiaminase
 - c) oxygenase
 - d) protein
- 4. Sweet lime and oranges are examples of _____ fruits.
 - a) allium
 - b) cruciferae
 - c) citrus
 - d) curcumin
- 5. Guavas and amla are good sources of _____.
 - a) vitamin D
 - b) riboflavin
 - c) vitamin C
 - d) vitamin A
- 6. The pigment present in tomatoes is
 - a) lycopene
 - b) anthoxanthin
 - c) anthocyanin
 - d) thiaminase

Part - B

Write short answers (2 marks)

1. Give examples of vegetables and fruits that are good sources of vitamin A and C
2. List any two health benefits of fibre in vegetables and fruits.
3. What are anthocyanins?

4. Give two examples for drupes and berries.
5. Explain the carbohydrate composition of vegetables and fruits.

Part - C

Answer in brief (3 marks)

1. How should greens be cooked to prevent loss of colour and nutrients?
2. List any two selection criteria while purchasing vegetables and fruits.
3. List the role of vegetables in cookery.
4. How are fruits classified?
5. Explain the nutritive value of green leafy vegetables.

Part - D

Answer in detailed (5 marks)

1. Classify vegetables based on part of plant consumed, giving one suitable example for each.
2. Briefly explain the nutritive value of vegetables and fruits.
3. Suggest some tips to increase the consumption of vegetables and fruits in the diet?
4. Classify the pigments present in vegetables and fruits. Write a short note on each pigment.
5. What are the nutritional benefits of eating vegetables and fruits?
6. What happens when cut vegetables and fruits are exposed to air? Explain the ways in which you can prevent this.
7. Explain how losses of nutrients can be prevented while cooking vegetables.

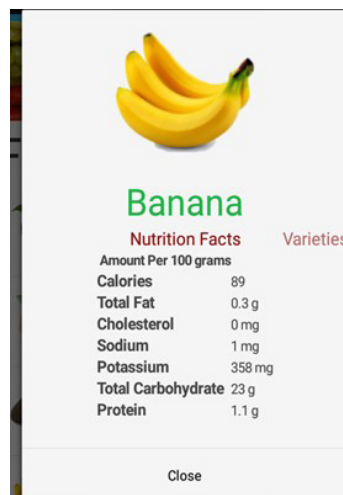


ICT CORNER

NUTRITION AND DIETETICS (FRUITS AND VEGETABLES)

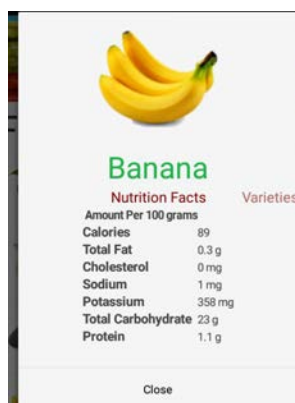
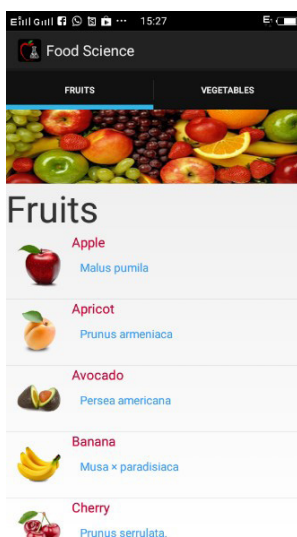
Fruits and Vegetables play very important role in the building and functioning of our body.

This app helps to find the nutrition facts in 100gms of fruits or vegetables (Total 28 fruits and 50 vegetables are given in this app)



STEPS:

1. Scan the QR code from your mobile. 'Food Science' page will open with two options.
2. You can select either fruits or vegetables. When we touch fruits or vegetables, the name of the fruits or vegetables will appear on the screen.
3. Touch any fruits or vegetables it will open with all the health benefits of that particular fruits or vegetables.



DOWNLOADING

To go inside the app directly you can either use QR code or the given link.

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