# VEGETABLES

Vegetables are plants or parts of plants that are used as food. The term vegetable has through usage come to apply in a more narrow sense to those plants or parts of plants that are served raw or cooked as a part of the main course of a meal.

Vegetables supply many nutrients besides providing variety to the diet. They make the food attractive by their colour, texture and flavour.

# CLASSIFICATION

Vegetables are classified according to the parts of the plants consumed or colour of the vegetable or according to the nutritive values. Nutritionally they are classified into 3 groups.

1. green-leafy vegetables
2. Roots and tubers
3. Other vegetables

# BOTANICAL CLASSIFICATION OF VEGETABLES

GROUPS

1. Roots:

carrot, beet root, radish, turnip, colocasia.

2. Tubers:

Potatoes, sweet potatoes, tapioca

3. Bulb:

Onion, garlic, leeks

4. Leaves:

Cabbage, lettuce, spinach, amarnth, fenugreek leaves, coriander leaves, mint leaves

5. Flowers:

Plantain flower, cauliflower, neem flower, broccoli

6. Fruits:

Tomatoes, brinjal, lady finger, pumpkin, cucumber, gourds(ash gourd, ridge gourd,) capsicum, drumstick, plantain.

7. Legumes:

Peas, beans, broad beans, fresh beans, double beans, bengal gram tender, red gram tender

8. Stems:

Plantain stem, ginger, amarnth stem, celery stem, lotus stem

9. Seed sprouts:

Green gram, bengal gram, soyabean sprouts

10. Fungi:

Mushrooms

11. Algae:

Spirulina

# COMPOSITION AND NUTRITIVE VALUE

## NUTRITIVE VALUE OF GREEN-LEAFY VEGETABLES

Leaves are the manufacturing organs of a plant where the life-giving process of photosynthesis takes place. In the cells, photosynthesis transforms elements into carbohydrates which are carried to other parts of the plant. The leaves in consequence are low in carbohydrates and energy but they are good soucres of B-carotene, calcium, riboflavin, folic acid, ascorbic acid, iron and vitamin K.

- Generally green-leafy vegetables are good sources of vitamins and minerals. They are excellent in carotenes which are converted to vitamin A. among all the greens colocasia leaves contain highest amount of carotene and cabbage has the last. The greener the leaves the higher the carotenes. B-carotenes are also good antioxidants.
- Greens are good sources of B-vitamins particulary riboflavin and folic acid. Drying and withering reduce B-vitamins.
- Green-leafy vegetables also contain C and can be used as substitute for fruits if needed. Agathi, drumstick leaves and coriender leaves contribute to vitamin C. the practice of using good as heating results in some loss of vitamin C.

- Green leafy vegetables are also rich in iron. The leaves normally discarded leaves like cauliflower leaves and beetroot leaves are excellent sources of iron.
- Agathi, colocasia leaves, drumstick leaves and fenugreek leaves contribute calcium in our diet.

The availability of calcium and iron to the body is limited as greens also contain oxalic acid.

- Greens generally are high in moisture and easily withered and need to preserve properly.
- Greens are not good sources of protein, fat and carbohydrates and hence they do not contribute to the energy value of food.
- Greens are good sources of fibre which help in preventing degenerative diseases.
- Of all the green leafy vegetables agathi is the most nutritious one.

# NUTRITIVE VALUE OF ROOTS AND TUBERS

- Roots and tubers gives more calories compared to green-leafy vegetables because they conatin more starches.
- Carrots contain high amount of carotene though this amount is lower when compared to the content present in green leafy vegetables.
- Roots and tubers are fairely good sources of vitamin C.
- They are poor source of calcuim, iron and B-vitamins.
- They are poor sources of protein.

# NUTRITIVE VALUE OF OTHER VEGETABLES

- They contain high amount of moisture and hence they are highly parishable.
- They are generally poor in all nutrients.
- They are fairly good source of vitamin C.
- They contribute to the fibre content of the diet.
- Plantain green contains high amount of iron.
- Capsicum contains vitamin C.
- Small bitter gourd is more nutritious than the ordinary one.

# SELECTION

- The desirable characteristics of different vegetables is as follows:-
  - **Beans** : tender, fresh, crisp, clean, firm velvety to touch, seeds, should be less than half grown, should break easily with sharp sound.
  - **Cabbage:** fresh, should be compact, no insect holes, no yellow or withered leaves.
  - **Carrots:** firm, fresh, smooth, yellow orange in colour, there should not be any wilted, soft or flabby portion.
  - **Cauliflower:** compact, no insect, fine heads, tender green leaves, should not be rough, flowers should not be spread out. The flowers should not be yellow. Yellow colours indicates over maturity.

- **Brinjal:** firm, bright, uniform dark rich purple or green colour, free of scars, or decay, should not be wilted, flabby or soft, no insect holes.
- **Lady finger:** young, tender, fresh tips should be broken easily, should not have any holes which indicate infestation, should not be hard while cutting.
- **Greens:** tender, fresh dark bright green, no holes in the leaves, no withered leaves, not with too much water, no soft portion of leaves. Greens should be crisp and stems should be thin.
- **Tomatoes:** bright red in colour, firm, should not be soft, plump body with uniform red colour, no holes, no over ripened, no cracks.

# STORAGE

## REFRIGERATED STORAGE

- Living organisms have an optimum temperature for growth and lower temperatures greatly retard metabolism and near the freezing point, rate of respiration is reduced. For every 18F decrease in temperature, the rate of reaction is almost halved. If foods are stored at temperatures near 32 and 34F the storage life may be prolonged as not only respiration rate is decreased but also growth of many spoilage micro-organisms also retarded but not totally inhibited. This is the principle behind refrigerated storage of fruits and vegetables. In this type of storage, in addition to temperature the relative humidity should be in such a way that there should not be too much moisture losses which cause wilting or too much moisture which may decay fruits and vegetables.

# COLD STORAGE OF FRUITS AND VEGETABLES

- Storage life of fruits and vegetables can be enhanced by storing them at temperatures below 40F. The exceptions are melon, cucumber, squash, egg plant, sweet potato, okra, tomato and certain tropical fruits like the banana, pineapple,etc. These have to be stored at higher temperatures. Before any commodity is stored in cold storage its field heat or sensible heat should be removed by placing in pre-cooling room, where the temperature is slightly higher than the optimum temperature and thereafter stored in cold rooms.

# WAXING OF FRUITS AND VEGETABLES

The principle of application of wax emulsion is based on partial coverage of these surface cells of the commodity there by reducing the respiration rates and therefore extension of storage life.

Wax coating prevents moisture loss, maintains the apperance, delays ripening and decreases the rate of delay and sprouting. This method of storage has been applied in the case of mango, banana, citrus fruits and potato.

# MODIFIED ATMOSPHERE PACKAGING

The normal composition of air is 78 percent nitrogen, 21 percent oxygen, 0.03 percent carbon dioxide and traces of noble gases. MAP(modified atmosphere packaging) is the method for extending the shelf life of perishable and semi-perishable food products by altering the relative proportions of atmospheric gases that surround the food.

One common method is to adjust the permeability of the packaging to match the respiration of the fruit or vegetables so that oxygen and carbon dioxide inside is optimally maintained.

The proportion of oxygen inside the package has to be lower than in air and of carbon dioxide higher. Such a mixture reduces the rate of respiration, inhibits the synthesis and retards microbial growth.

# ANTI NUTRITIONAL FACTORS

There are some anti nutritional factors:-

1. **Cyanogens**

Some legumes like kidney bean, red gram and linseed cassava, and many fruit pits contain cyanogenic glycosides from which hydrogencyanide may be released by hydrolysis.

**2. Alkaloids**

Alkaloids are the bitter components of plants found widely in nature and frequently have pharmacological properties. Alkaloids are often basic nitrogen-containing compounds able to form salts with acid. Alkaloids have been isolated from the roots seeds, leaves or bark of some members of at least 40 percent of plant families.

## 3. Protease inhibitors

Protease inhibitors are widely distributed within the plant kingdom, including the seeds of most cultivated legumes and cereals. Protease inhibitors are the most commonly encountered class of antinutritional factors of plant origin.

## 4. Favism

Favism is a disease characterized by haemolytic anaemia which affects certain individuals following the ingestion of fresh or cooked broad beans. The biochemical abnormality which affects the metabolism of glutathione in red blood cells and is the result of decreased activity of the enzymes glucose-6-phospate dehydrogenase.

## 5. Lectines

- Lectin comes from the latin word "legere", which means "to select". Lectins have the ability to bind carbohydrates. Nowadays, proteins that can agglutinate red blood cells with known sugar specificity are referred to as "lectins".

## 6. Saponins

Saponins are water-soluble plant constituents, which can form soapy foam even at low concentrations. They are glycosides with a non-sugar aglycone portion which is termed a sapogenin. Saponins are distinguished by their bitter taste, and ability to haemolyse red blood cells.

## 7. Lathrogens

Lathyrogens, found in legumes such as chick peas, are derivatives of amino acids that act as metabolic antogonists of glutamic acid, a neurotransmitter in the brain. When lathyrogens are ingested in large amounts by humans or animals, they cause a crippling paralysis of the lower limbs and may result in death.

## 8. Phytates

Phytate is the salt form of phytic acid, are found in plants, animals and soils. In monocotyledons such as wheat and rice, phytates is present in germ of corn and in the aleurone or bran layer allowing an easy separation by milling. However, in legumes, nuts and oil seeds, phytates are found closely associated with proteins and is often isolated or concentrated with protein fraction of these foods.

# USES IN COOKERY

Vegetables are used universally in all recipes.

- They are used in curries, salads and in sambhar.
- They are used as garnishing agents e.g., shredded carrot and corriender leaves.
- They are used as stuffing in samosa and paranthas.
- They are used in thickening agents in gravies and soups.
- They are used in chutneys (onion) and pickles (tomato, onion).
- They are used as part of recipes like pulao, aluvadi and in non-vegetarian dishes.

# THANKYOU!

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