Chapter I

GENERAL CONSIDERATION ABOUT SELECTED PLANTS

Vegetables are foods we obtain from the leaves, stems, roots, or tubers while fruits are the product of a ripened ovary. A better definition of a vegetable is a part of a plant eaten cooked or raw, usually with the main part of the meal. Fresh vegetables are an important part of our diets. They provide vitamins, minerals and complex carbohydrates for energy. Vegetables provide bulk (fiber) to our diets; yet tend to be lower in calories than other food groups since they are low in fat (Gopalan et al. 1996).

Goitrogens are foods that suppress thyroid function. In normal goitrogens can induce hypothyroidism and goitre. In hypos, goitrogens can further depress thyroidal function and stimulate the growth of the thyroid (goitre). Many goitrogens are generally members of the Brassica family (Gaitan 1990).

There are about 435 genera and 3675 species of Brassicaceae (including Capparaceae) worldwide, the genus Brassica consists of over 150 species of annual and biennial herbs, several of which are cultivated as oil-seed crop (rape and mustard) or as vegetable crops (cabbage, cauliflower). The seeds of some yield the condiment, mustard. A few brassicas furnish fodder and green manure (Wealth of India 1954).

Within the Brassica family, the glucosinolates, a group of sulphur-containing glucosides have been the subject of a vast amount of study and the effects of dietary inclusion of such compounds or their metabolites on the health of animals and man. These compounds remain intact unless brought into contact with the enzyme myrosinase by pests, food processing or chewing. Myrosinase releases glucose and breakdown products, including isothiocyanates (Van Etten 1969). The major focus of research has been on the negative aspects of these compounds because of the prevalence of certain "anti-nutritional" or goitrogenic glucosinolates in the protein-rich defatted meal from widely grown oilseed crops and in some domesticated vegetable crops. People have in some instances learnt to deal with these effects by cooking and other forms of preparation. There is, however, an opposite and positive side of this picture represented by the therapeutic and prophylactic properties of other "nutritional" or "functional" glucosinolates (Mithen 2001).
Table 3. Approximate composition of selected plants (Gopalan et al. 1996)

<table>
<thead>
<tr>
<th>Plant food</th>
<th>Moisture (g)</th>
<th>Energy (kcal)</th>
<th>Protein (g)</th>
<th>Fat (g)</th>
<th>Carbohydrate (g)</th>
<th>Fibre (g)</th>
<th>Mineral (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cabbage</td>
<td>91.9</td>
<td>27</td>
<td>1.8</td>
<td>0.1</td>
<td>4.6</td>
<td>1.0</td>
<td>0.6</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>80.0</td>
<td>66</td>
<td>5.9</td>
<td>1.3</td>
<td>7.6</td>
<td>2.0</td>
<td>3.2</td>
</tr>
<tr>
<td>Mustard</td>
<td>8.5</td>
<td>541</td>
<td>20.0</td>
<td>39.7</td>
<td>23.8</td>
<td>1.8</td>
<td>4.2</td>
</tr>
<tr>
<td>Radish</td>
<td>94.4</td>
<td>17</td>
<td>0.7</td>
<td>0.1</td>
<td>3.4</td>
<td>0.8</td>
<td>0.6</td>
</tr>
</tbody>
</table>

All the values are per 100 gms of edible portion.

CABBAGE

Scientific Name- Brassica oleracea var. capitata (Linn.)

Common name – Cabbage

Hindi - Band-gobi, Patagobhi, Kobi, Karamkalla

Bengali – Bandhakapi, Kopi

As a member of the Cruciferous family, cabbage is related to other vegetables like cauliflower, broccoli, kale and Brussels sprouts. Cabbage grows along the coasts in Europe and North Africa, thrives best in the temperate climates. The earliest records of cabbage being cultivated for food come from the Greeks around 600 BC. Today cabbage is grown for food everywhere that plants can be grown. In India it is cultivated on the hills and during cold season also in the plains. Although a biennial it is grown as an annual crop (Ghosh and Maddhvi 1998).

Cabbages are also used as vegetables. It is eaten either as salad or cooked; red cabbage is proffered for pickling. Steaming is preferred to boiling. It is also used as feed for livestock and chicken. Cabbage is included in the diet of patients, particularly the ones suffering from fistula and liver troubles (CSIR 1986).

Cabbage contains vitamin C as well as a large number of minerals, including iodine, sulfur, calcium, magnesium, and potassium. The outer leaves contain more vitamin E and calcium than the inner leaves. Cabbage also contains small amounts of the indigestible food fibers of cellulose, hemicellulose, pectin, and lignin, which are found in the structural stringy parts of the plant (Wealth of India 1948).
Cabbage is grown to clustered leaves in a compact "head", with maybe a few loose outer leaves around the base. This is the way cabbage grows until longer days and warmer weather signal it to bolt to flower. Then, the head splits open and gives birth to a stalk that uncurls itself as it forces the split head farther open. The stalk grows to about 1.2 m tall, then branches and develops numerous small, 4-petaled, cross-shaped yellow flowers that eventually develop into elongate seed pods (Wealth of India 1948).

**Fig 8. Cabbage Brassica oleracea var. capitata (Linn.)**

It is in flower from May to August, and the seeds ripen from July to September. The flowers are hermaphrodite (have both male and female organs) and are pollinated by bees. The plant is self-fertile. It can grow in semi-shade (light woodland) or no shade, but grows best in full sun (Wealth of India 1948). Cabbage is easy to grow in cool weather. It requires moist soil and can tolerate maritime exposure. It takes anywhere from 60 to 120 days from seed to maturity, depending on air temperature and the particular cultivar. Some cultivars will sprout new side heads after the main head is cut off (Wealth of India 1948).

**CAULIFLOWER**

Scientific Name - *Brassica oleracea var. botrytis* (Linn.)

Common Name - Cauliflower

Hindi - Phoolgobhi

Bengali - Fulkapi

Cauliflower is the plant belonging to the Brassicaceae family, consisting of a compact terminal mass of greatly thickened, modified, and partially developed abortive flower structures or 'curds', together with their subtending fleshy stalks. Cauliflower takes its name from the Latin words caulis meaning stalk and floris meaning flower. As the head forms, the cauliflower crown is shaded from the sun in order to protect its milky white
color; this prevents chlorophyll from developing and turning it green (Wealth of India 1948). It is believed that cauliflower originated in Cyprus, where the oldest record dates from the 6th century BCE. The cauliflower owes its name to various sources (Madhavi and Ghosh 1998).

Cauliflower is used as a vegetable in curries, soup etc. and is also pickled. In places where production is large, it is dried and preserved for use in the off-season. Small seedlings are used as greens. The leaf stalks also are cooked as a vegetable. Leaves and stems of cauliflowers obtained as wastes are utilized as livestock feed (CSIR 1986). It is also a good source of carbohydrates, dietary fibre, vitamin B, C and potassium. Cauliflower boosts the immune system, may help to prevent cancer, spina bifida and heart diseases (Wealth of India 1948).

![Cauliflower](image)

**Fig 9. Cauliflower** (*Brassica oleracea* var. *botrytis* Linn.)

Cauliflower and broccoli are two derivatives of cabbage, both selected for their edible, immature flower heads (Madhavi and Ghosh 1998). As desired for food, this terminal cluster forms a firm, white, succulent "curd." The broad, much-elongated leaves extend far above this curd. In most varieties the leaves must be tied together well above the curd, or broken over it, several days before harvest to prevent discoloration of the curd by sunlight.

Main growing areas lie in China, India, west and mid Europe, also cultivated in tropical zones of Africa, mid and south America and Oceania. It prefers deep, humus-rich soil with a good supply of water and high humidity. Cauliflower is cultivated in most parts of India, especially in north-west where it is grown on a large scale (Wealth of India 1948). The plant grows to about 0.75 m high. It is in flower from May to August, and the seeds ripen from July to September. The flowers are hermaphrodite (have both male and female organs) and are pollinated by bees (Madhavi and Ghosh 1998).
Plant can grow in semi-shade (light woodland) or no shade. It requires moist soil. The plant can tolerate maritime exposure. These are very popular as winter vegetables; attempts to grow cauliflower during summer months in the plains have been successful (Wealth of India 1948).

**MUSTARD**

Scientific Name- *Brassica juncea* (Linn.) Czern.

Common name – Indian Mustard

Hindi - Rai

Bengali – Rai

The word Mustard is from the Latin mustum ardens, meaning 'burning must' because the ground seeds have been mixed with grape must (unfermented grape juice) to make the condiment Mustard. Mustard seed has been known as a spice since early times. It is described in Sumerian and Sanskrit texts from as early as 3000 BC, in Egyptian texts around 2000 BC, and in Chinese writings before 1000 BC. In medieval Europe, Mustard was one of the most common spices used to flavour the diet of the time (Wealth of India 1948).

*Brassica juncea* is a self fertile species and is a very variable annual. Its narrow based seed leaves are not stem clasping like those of Toria and Sarson (other varieties of mustard). The seeds are rugose, reddish brown and generally smaller. Perennial herb, usually grown as annual or biennial, up to 1m or more tall, branches long, erect or patent. Mustard leaves are yellowish to medium green and fairly wide. When they are mature, the plants are large, loose and open. It is grown commercially for its seeds, which are dried and ground to make the familiar condiment mustard (Wealth of India 1948). *Brassica juncea* grown as an oilseed crop is of major importance in the countries of the Indian subcontinent, China and the southern Ukraine. Indian production statistics for 1990-1991 report a combined rapeseed and mustard production of 4.22 million tonnes (Kothari 1992).

Young leaves may be finely chopped and added to salads. Leaves can be cooked as a green vegetable. Flowers are edible in salads and as a garnish. Seeds are used in pungent sauces, curries dips, sandwich spreads, salad dressings and cheese dishes.
Condiment mustard has been principally used with meat or fish dishes, not least to improve or disguise strong flavours or, indeed, off-flavours (CSIR 1986). It has a wide range of activities like analgesic, antiseptic, carminative, disinfectant, diuretic, expectorant and stimulant. The condiment forms of *B. juncea* contain predominantly 2-propenyl (allyl) glucosinolates (sinigrin) that hydrolyses to yield allyl isothiocyanate. Known colloquially as 'volatile oil', this volatile compound gives a strong olfactory pungency and is even lachrymatory (Kirk and Oram 1981).

**Fig 10. Two varieties of mustard seeds**

Mustard seeds present three fundamental physical problems to the processor: their small size (*B. juncea* 1.63 mm mean diameter), appreciable seed coat content (up to 20% by weight) and substantial oil content (30-45% by weight). The seed coat is relatively tough and fibrous in texture (Hemingway 1976). *Brassica juncea* has pungent olfactory flavour. The seed coat fraction is a principal by-product of the dry-milling process. Seed coats of *B. juncea* have very limited application, occasionally being used as a ‘filler’ after drying and grinding and, if desired, heat inactivation of the myrosinase enzyme (Hemingway 1976).

**RADISH**

Scientific Name - *Raphanus sativus* Linn.
Common Name - Radish
Hindi - Muli
Bengali – Mula

The radish is thought to be native to Asia, but domesticated in the Mediterranean. Depicted in the pyramid of Cheops, it was cultivated by the Egyptians in 2780 BC. By 500 BC, the radish was grown in China and reached Japan 200 years later.
The ordinary Greek term for any radish was raphanos; and the Latin was raphanus, which made its way into the botanical classification. The everyday English term is derived from the Latin word for root, radix. Radish is an annual or biennial plant in the family Cruciferae that is grown for its large, succulent root. The common radish is probably of Oriental origin. Fleshy roots are usually eaten raw in salads and the young tops are sometimes shredded and added to salads or cooked as a vegetable, appetizing. Fruits are also eaten raw or cooked. The leaves are also boiled and eaten. It is much relished for its pungent flavour and is considered as appetizer (Wealth of India 1954).

Roots are used as a diuretic in urinary troubles. Seeds are used as expectorant, diuretic and carminative. Seeds yield non-drying fatty oil suitable for soap making, also for edible purposes. Seed cakes are rich in proteins and appear to be suitable for use as manure and after removal of isothiocyanates as a foodstuff (CSIR 1986).

Fig 11. Radish (*Raphanus sativus*) Linn.

It is cultivated throughout India and up to 3000 mt in the Himalayas and other hilly regions. In general, the radish is a cool season crop, though but there are some indigenous types that can be grown throughout the year. There are certain regions in the country viz. south India where radish is cultivated all round the year. The plant grows to about 0.5 m by 0.2 m at a fast rate. It is in flower from June to August, and the seeds ripen from July to September. The flowers are hermaphrodite and are pollinated by bees and flies. The plant can grow in semi-shade or no shade. It requires moist soil (Wealth of India 1954). Generally, flower stalks form the first season, bearing white or lilac-veined flowers. The seeds are borne in a pod called a silicle. The root is best harvested before the plant flowers. Radishes are available all year long, and are at their peak from June through September (Wealth of India 1954).