5. *Cow pea:* The cow pea contain trypsin inhibitors, lectins (haemagglutinins), polyphenols.
6. *Moth Bean:* Moth bean seeds contain antinutritional factors such as trypsin inhibitors, polyphenols, phytic acid, saponins, oxalis acid and amylase inhibitor.
7. *Lentil:* Lentil seeds contain relatively low levels of antinutritional factors. These factors include trypsin inhibitor, haemagglutinins, polyphenols, phytic acid, flatulence factors, α-amylase inhibitor, cyanogens and saponins (Table 9.1).

Table 9.1: Utilization problems of legumes and cereals and possible causes

	Problems	*Causes*
Legumes	• Incomplete protein	• Limiting amount of methionine and cysteins
	• Incomplete availability of amino acids	
	• Low protein digestibility	• Nature of protein, protease inhibitors
	• Antinutritional factors	• Protease inhibitors, haemoagglutin, goitrogens, etc.
	• Flatulence	• Oligosacchariders, dietary fibre, lipoxygenase.
Cereals	• Low protein content incomplete protein	• Limiting amount of lysine, and in some cereals trypto-phan, threonine.

Sprouted Pulses

Pulses are good in protein, CHO, vitamin B and fair in mineral content. But vitamin C is not present in them. On sprouting this deficiency can be rectified. To sprout, cleaned pulse is soaked for 24 hours and then it is spread on a muslin cloth, sprinkling water occasionally on it. After 24 hours tiny sprouts appear on the surface. These sprouts are very rich in vitamin C and carotene. Sprouted pulses are very tender and cooking is not necessary. They can be used as raw salad by sprinkling lime juice and salt or as raitas by adding curd and salt to it.

Vitamin C Content of Sprouted Legumes (Table 9.2)

Table 9.2: Vitamin C in sprouted legumes

Period of germination	*Vitamin C*
Dry legumes	Trace
After 24 hours germination	7–12 mg/100 g
After 48 hours germination	11–18 mg/100 g
After 7 hours germination	13–20 mg/100 g

significantly contribute to scavenging of free-radicals produced through metabolic processes in leaves, since they are located in the vacuole, and thus spatially separated from metabolic reactive oxygen species. Some studies have shown that hydrogen peroxide produced in other organelles can be neutralized by vacuolar anthocyanins. Most frequent in nature are the glycosides of cyanidin, delphinidin, malvidin, pelargonidin, peonidin and petunidin. Roughly 2% of all hydrocarbons fixated in photosynthesis are converted into flavonoids and their derivatives such as the anthocyanins.

Metals, such as iron from non-stainless-steel preparation tools, change the natural purplish pigment to a blue-green colour. Therefore, food products containing the anthocyanin pigment are often canned in enamel-lined metal cans to prevent the product acid from interacting with the can metal and causing undesirable colour changes.

Anthoxanthins: Anthoxanthins are water-soluble pigments, is also a flavonoid which range in colour from white or colourless to a creamy to yellow, often on petals of flowers. These pigments are generally whiter in an acid medium and yellowed in an alkaline medium. They are water soluble and occur in the vacuoles of plant cells. Anthoxanthins classification represents flavone, flavonol, flavanone, and flavanol pigments, and gives colour to apples, cauliflower, onions, potatoes, turnips and spinach or other leafy vegetables. In green leafy vegetables the colour is masked by chlorophyll. They are very susceptible to colour changes with minerals and metal ions, similar to anthocyanins. As with all flavonoids, they exhibit antioxidant properties, and are important in nutrition, and are sometimes used as food additives. Darkening with iron is particularly prominent in food products. They are considered to have more variety than anthocyanins. Some examples are quercitin. The pigments are frequently found in conjunction with anthocyanin pigments, affecting their colour.

Betalains: The name "betalain" comes from the Latin name of the common beet (*Beta vulgaris*), from which betalains were first extracted. The deep red colour of beets, bougainvillea, amaranth, and many cacti results from the presence of betalain pigments. They are similar to, but not categorized as anthocyanins or anthoxanthins. There are two categories of betalains—betacyanins include the reddish to violet betalain pigments, betaxanthins are those betalain pigments which appear yellow to orange.

Tannins: Tannin is an astringent, bitter plant polyphenolic compound that binds to and precipitates proteins and various other organic compounds including amino acids and alkaloids. The astringency from the tannins causes the dry and puckery feeling in the mouth following the consumption of unripened fruit or red wine. They may be responsible for the unwanted brown discoloration of fruits and vegetables, as well as for the desirable changes that provide tea leaves with their characteristic colour. They range in colour from pale-yellow to light brown. Tannins contain antioxidant properties in it.

12 Flesh Foods

MEAT

Much evidence from many civilizations has verified that the meat of wild and domesticated animals has played a significant role in human nutrition since ancient times. In addition to the skeletal muscle of warm-blooded animals, which in a strict sense is "meat", other parts are also used: Fat tissue, some internal organs and blood. Definitions of the term meat can vary greatly, corresponding to the intended purpose. From the aspect of food legislation, for instance, the term meat includes all the parts of warm-blooded animals, in fresh or processed form, which is suitable for human consumption.

Composition of Meat

Muscle of meat is composed of 75% of water, 20% of protein and 5% of fat, carbohydrates and minerals. The composition of meat varies with its sources, season of the year and pH of the meat. Protein comprises about four-fifths of the solid material. True fat, fat-like substances called phospholipids, inorganic substances and vitamins are present.

Veal is the meat from cattle slaughtered three to fourteen weeks after birth. Calf is from fourteen to fifty-two weeks old animal. Beef is from cattle over one year old. A heifer is female cattle that have never borne a calf. Red meat is the meat from mammals, white meat is the meat from poultry, seafood is referred to fish, prawn, etc. and game is from non-domesticated animals.

Meat has skeletal or muscular cuts and organ cuts. Skeletal or muscular cuts have muscle, tissue, connective tissue, bone fats and nerve tissues. Muscle tissue and connective tissue supply the qualities of meat in cookery. Muscle structure is made up of bundles of muscle fibres called fascicule. Connective tissues are scattered throughout the muscles where they play a connecting and supporting role. White fibrous and yellow elastic fibres with proteins like collagen and elastin are present in all muscle. Collagen contributes strength and elastin supplies elastic quality to meat. Collagen reacts with water in hydrolysis to produce gelatin and brings about a tenderizing effect to the meat. But no sack change is brought in elastin and

5. The surface should be free of dirt and slime.
6. The flesh should be firm to touch with no traces of browning or drying around the edges.
7. A fish having odour indicates deterioration due to oxidation of polyunsaturated fat and bacterial growth. Rancidity is revealed by yellowish spots on the surface. Rancidity can be recognized by sour taste, uncharacteristic of fresh fish.
8. Prawns should be fresh and firm, strong colour, and with no unpleasant smell.
9. Scallops should be pinkish white or pale yellow, feel firm, and should give off clear liquid.
10. Clams, cockles, oysters and mussels with tightly closed and heavy for their size, should be selected and their shells should not be cracked.

Grading

Grading determines the quality level. Only products have an established grade standard can be graded. Industry uses the grade standards to buy and sell products. Consumers rely on grading as a guide to purchase products of high quality. Grade A mark indicates that the product is of high quality. It is uniform in size, practically free of blemishes and defects, in excellent condition, and has good flavour and odour.

To determine the grade of processed fish, each fish scored for the following factors:

- Appearance: The overall general appearance of the fish, including consistency of flesh, odour, eyes, gills, and skin.
- Discoloration: This refers to any colour not characteristic to the species.
- Surface defects: These include the presence of fins; ragged, torn, or loose fins; brulses; and damaged portions of fish muscle.
- Cutting and trimming defects: These include body cavity cuts, improper wahing, improper deheading and evis-creation defects.
- Improper boning: for boned styles (fillet) only, this refers to the presence of an unspecified bone or piece of bone.

After inspecting each fish, the number of defects is totaled. Grade A is given when the maximum number of minor defects is three or less and no major defects. Grade B is given to fish with up to five minor defects and one major defect. Grade A fish must also possess good flavour and odour for the species, and grade B must possess reasonably good flavour and odour for the species.

Products: Fresh or frozen fish can be marketed as whole or round, dressed or pan-dressed, fillets, drawn fish, steaks, sticks, or nuggets.

Preservation: Fish are preserved by drying, salting, curing, or smoking. Some progress is being made on the use of irradiation. Refrigeration, freezing, and canning remain the best methods for preserving the quality of fish.