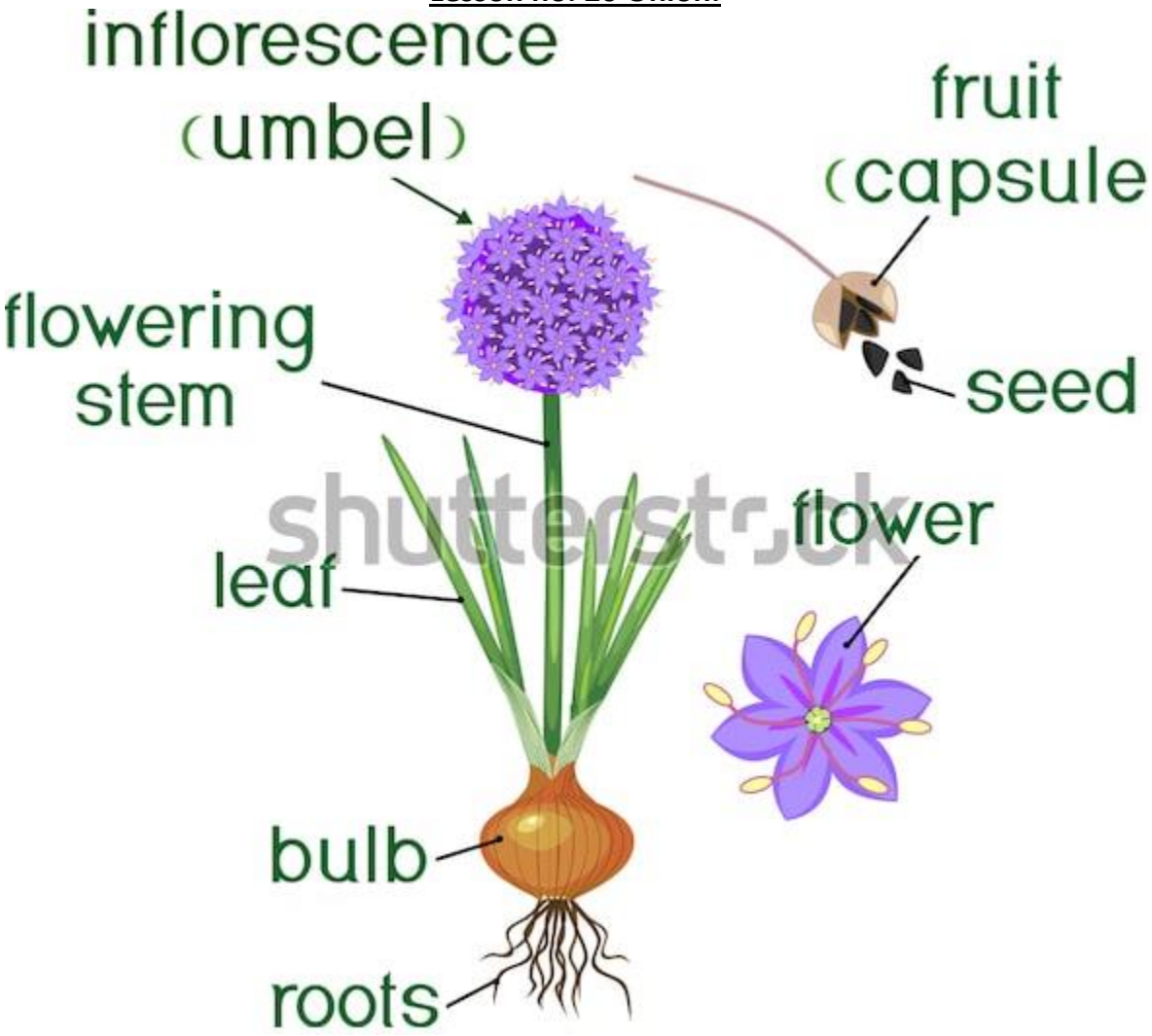
Lesson no. 20 Onion.



Onion is among the famous vegetables used by mostly all people through the world except few cast of Jain; onion is present in every home & is add to almost all dishes; it is used in cooking to add taste & increase the bulk, also its leaves a used in rice, salad etc; also onion is eaten raw as salad or prickled raw as a dressing to add taste & variety; but do you know that onion has a lot of health benefits; it cheap easy available all season; it is a medicinal herb ideal to use in cooking or eating; only its odour from our mouth after eating raw onion is the problem; it should be eaten raw in lot of quantity at onetime as to fulfill hunger, it should be eaten in small quantity regularly or used in cooking as per the need; it is from Liliaceae or Amaryllidaceae family, it is a root bulb detail of it is given below; there are many types of onion in world based on different region, climate, soil & harvesting method.

It is mentioned in Quran in chapter 2 Sura Baqarah verse no. 61; also it is mentioned in many book of Hadith & its odour from our mouth after eating its raw in bulk quantity is disliked & prohibited to come in mosque & public with its odour from mouth. Please visit my website www.tib-e.nabi-for-you.com for detail Islamic study on onion; direct link to lesson onion http://www.tib-e-nabi-for-you.com/Onion.html or read my English book part 2 Tibb e Nabawi lesson no. 37 Onion page 71.

- ***NAMES OF ONION: -***

1. It is called as Basal (البصل) in Quran, Hadees & Arabic.
2. In Latin it is called as Allium cepa Linn.
3. Family is Liliaceace or Amaryllidaceae.
4. In Urdu & Hindi it is called as Piyaz.

1. ***Chapter No. 2 (Surah) Baqarah verse no. 61: -***

وَإِذْ قُلْتُمْ يَٰمُوسَىٰ لَن نَّصْبِرَ عَلَىٰ طَعَامٍ وَٰحِدٍ فَٱدْعُ لَنَا رَبَّكَ يُخْرِجْ لَنَا مِمَّا تُنۢبِتُ ٱلْأَرْضُ مِنۢ بَقْلِهَا وَقِثَّآئِهَا وَفُومِهَا وَعَدَسِهَا وَبَصَلِهَا ۖ

And (remember) when you said, "O Musa (Moses)! We cannot endure one kind of food. So invoke your Lord for us to bring forth for us of what the earth grows, its herbs, its cucumbers, its Fum (wheat or garlic), its lentils and its onions." He said, "Would you exchange that which is better for that which is lower? Go you down to any town and you shall find what you want!" And they were covered with humiliation and misery, and they drew on themselves the Wrath of Allah ﷻ. That was because they used to disbelieve the Ayat (proofs, evidences, verses, lessons, signs, revelations, etc.) of Allah ﷻ and killed the Prophets wrongfully. That was because they disobeyed and used to transgress the bounds (in their disobedience to Allah ﷻ, i.e. commit crimes and sins).

- ***In following Hadith, it is mentioned: -***

Ibn Majah; Abu Dawud, Bukhari, Tyalsi.

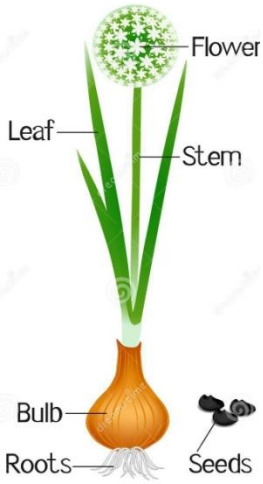
In Hadith it is allowed to use onion in cooking & eating but eating a lot of raw onion & coming in public or in masjid in prohibited because people may get irritated by its bad odour from mouth.

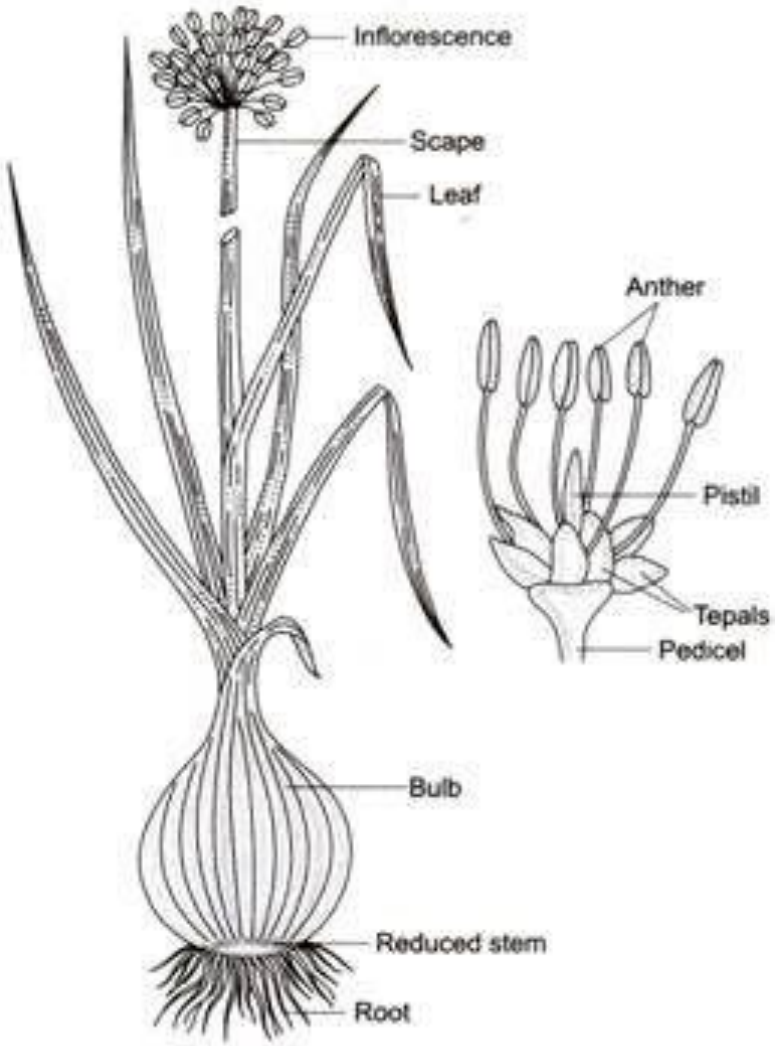
In Prophet ﷺ time mostly people were poor, in Arab much vegetables did not grew, vegetables from other parts of the world were not every time available, people use to eat raw onion very often & we all know that it has a very offensive smell in breath which irritates other people, & Prophet ﷺ strictly prohibited to eat, but allowed to eat it in cooked food, & prohibited to come in Masjid or near it with its smell in breath, because in Masjid there are angles, who also get irritated with its smell, And by this rule all bad smell things should be avoided in Masjid or near it. The people often use to come in Masjid with its smell in breath, may be people ate raw onion in much quantity to fulfill their hunger, & it is seen that the bad smell is very offensive if raw onion is eaten in much quantity & remains for very long in the breath & also its smell is found in sweating which is again bad. And also cause excessive unwanted gas formation & its expulsion & if this occurs in public it is thing which irritates others.

- ***CONCLUSION OF HADEES: -***

1. Do not come in Masjid or in public after eating raw vegetables with bad odour of garlic coming from your mouth. We can eat them cooked in food & bad smell should not come from mouth. Nabi صلى الله عليه وسلم did not liked bad smell, specially from mouth because Angle use to come to Him bringing Messages & Quranic verses from Allah & Angles get irritated by its bad smell even people get irritated.

- ***Onion Plant: -***





(a)

Most commercially cultivated onions are grown from the plant's small black seeds, which are sown directly in the field, but onions may also be grown from small bulbs or from transplants. Onions are a cold-season crop, easy to grow because of their hardiness; plant onion sets outdoors when the weather is cool—not cold. Ideally, outdoor temperatures shouldn't dip below 28°F (-2°C) after planting. Onion plant is an herbaceous biennial plant in the amaryllis family (Amaryllidaceae), grown for its edible bulb onion. The common onion plant has one or more leafless flower stalks that reach a height of 75–180 cm (2.5–6 feet), terminating in a spherical cluster of small greenish white flowers. The concentric leaf bases of the developing plant swell to form the underground edible bulb onion. Onion plant is very hardy and can survive in a wide range of growing conditions. The stem of the plant is a flattened disc at the base and the tubular leaves form a pseudo-stem where their sheaths overlap. The leaves are either erect or oblique and there are 3–8 per plant. The onion plant produces pink or white flowers clustered on stalks. The bulbs are formed just above the flattened stem of the plant by overlapping leaves. The stems and leaves are also edible. They require a fertile, well-draining soil such as clay or silt loams with a pH of 5.5–6.5. The plants do not do well in acidic soils. Onions should be set out in full sun for optimum bulb development. Onions are biennial vegetables and if they are left in the ground for a second year, they will produce flowers and set seed. Onion has long hollow leafless stems that arise from the terminal bud and bear the inflorescence. Flower stalks may also arise from lateral buds. The terminal inflorescence develops from the ring-like apical meristem. Scapes, one or more, elongate from 30 to more than 100 cm above the leaves. The scape is a long, leafless flower stalk extending between the spathe and the last

foliage leaf. At first, the scape is solid but, by differential growth, becomes thin walled and hollow. The onion scape has a characteristic spherical bulge along its length. The total number of developing scapes depends on the number of sprouted lateral buds.

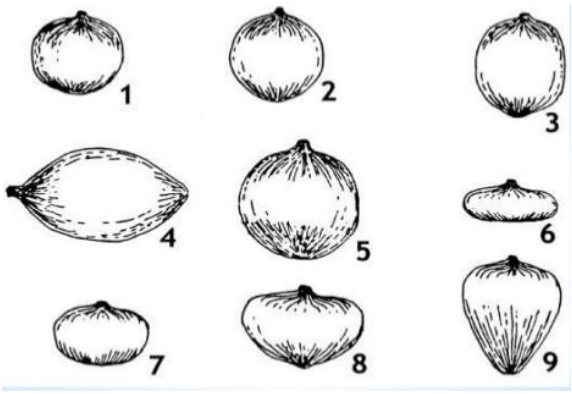
- ***Onion flower: -***

Onion flowers are male and female flower; parts develop at different times so they are cross pollinated by insects. The flowers are visited by a range of insects, including bees, flies, and other insects, that collect pollen and nectar (Parker, 1982). The duration of anthesis of an individual umbel is roughly 4 weeks. Honey bees reluctantly visit onion flowers to collect both nectar and pollen. Inflorescence of onion is called cume. Each individual flower is made up of six stamens, three carples, united with one pistil and six perianth segments. The pistil contains three locules, each containing two ovules. Flower is in clusters of star-shaped flowers in shades of pink, white, blue, purple, or yellow. There are both tall-growing species (to 4 feet or higher) and miniature ones.

- ***Onion Seeds: -***

Onion plant is biennials only bloom and produce seed during their second year. Harvesting of onion seeds is done when the umbrels or flowering heads begin turning brown; we should carefully clip the stalks a few inches below the head and place them in a paper bag; set the bag in a cool, dry place for several weeks; when the heads are completely dry, shake them vigorously within the bag to release the seeds. Onion seeds are formed in it flowers; there are 42 onion seeds in the average flower. The seeds are glossy black and triangular in cross section. The seeds grow in the 2nd year again the plants re-grows new leaves appear & in the new flower seeds are grown; its seeds have a lot of health benefits. Onion seed constitutes 38% of oil that is responsible for its aromatic flavor. The seeds are used as flavoring agents while cooking. The seeds need to be toasted to enhance their fragrant tinge. The seeds are also added in various forms of bread like naan, paratha, chapatti, etc. In few parts of the world, onion seeds are also used to season fish. Black onion seeds are rich in dietary value. The seeds contain amino acids, proteins and several essential minerals. Onion seed oil is known for its medicinal value. The oil is said to be the best cure for several body ailments. Onion seeds are sold in market by the name of black seed (black caraway seeds) though both are different.

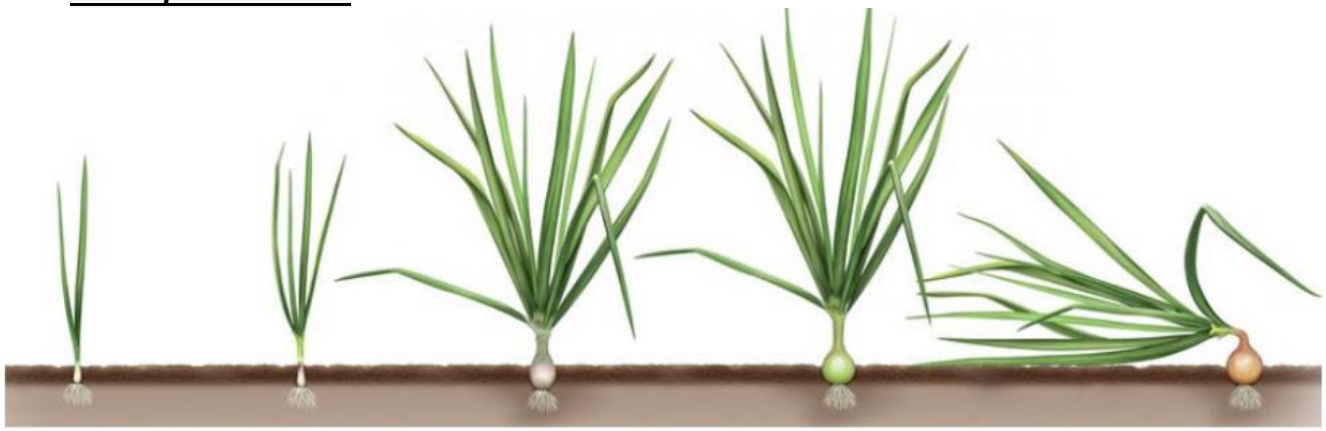
- ***Onion bulb: -***



The bulbs (onion) vary in size, shape, colour, and pungency, though warmer climates generally produce onions with a milder, sweeter flavour than do other climates. The onion's characteristic pungency results from the sulfur-rich volatile oil it contains; the release of this oil during peeling or chopping brings tears to the eyes. The bulbs are composed of shortened, compressed, underground stems surrounded by fleshy modified scale (layers) that envelop a central bud at the tip of the stem. Bulb is modified stem of globe shape & covered a scaly membrane (skin); it has lot of health benefits; it is white, orange, red, light purple etc in colour.

Chopping an onion causes damage to its cells which allows enzymes called as alliinases to break down amino acid, sulfoxides and generate sulfenic acids. A specific sulfenic acid, 1-propenesulfenic acid is rapidly acted on by a second enzyme, the lachrymatory factor synthase (LFS), giving syn-propanethial-S-oxide (a volatile gas known as the onion lachrymatory factor or LF). This gas diffuses through the air and soon reaches the eye, where it activates sensory neurons, creating a stinging sensation. Tear glands produce tears in order to dilute and flush out the irritant.

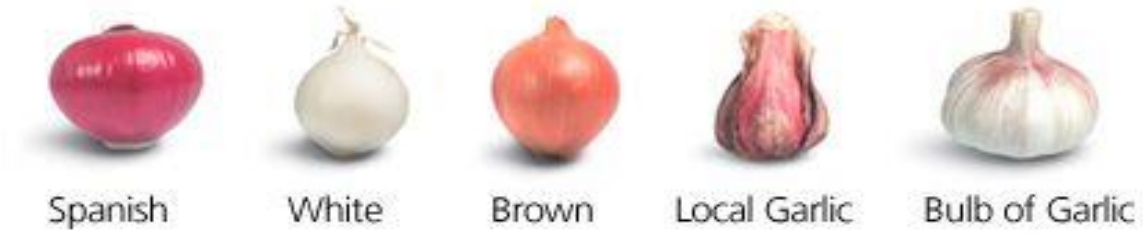
- ***Onion plant roots: -***



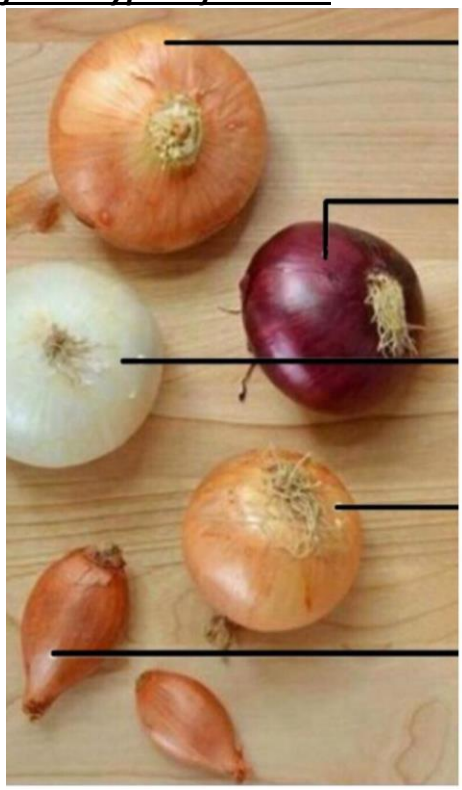
Establishment	Vegetative growth	Bulb initiation	Bulb development	Maturation
30 Days	30 Days	30 Days	45 Days	15 Days
1 to 2 true leaves	From 4 to 7 true leaves. 'leek' stage, the fourth leaf appears and the neck of the plant starts to thicken	Bulb diameter is twice that of the neck, 8 to 12 true leaves. The second and third leaves fell. The plant reaches maximum height	Leaves continue to grow and elongate but the total leaf area and number of leaves stay about the same	Bulb enlargement near completion; more than 50 percent tops down.

The onion has a fibrous root-system consisting of 20 to 200 shining white, rather thick roots. Some of these spread horizontally just beneath the surface soil 12 to 18 inches on all sides of the plant before turning downward.

- ***Types of onion: -***



- ***<u>Uses of different types of onion: -</u>***



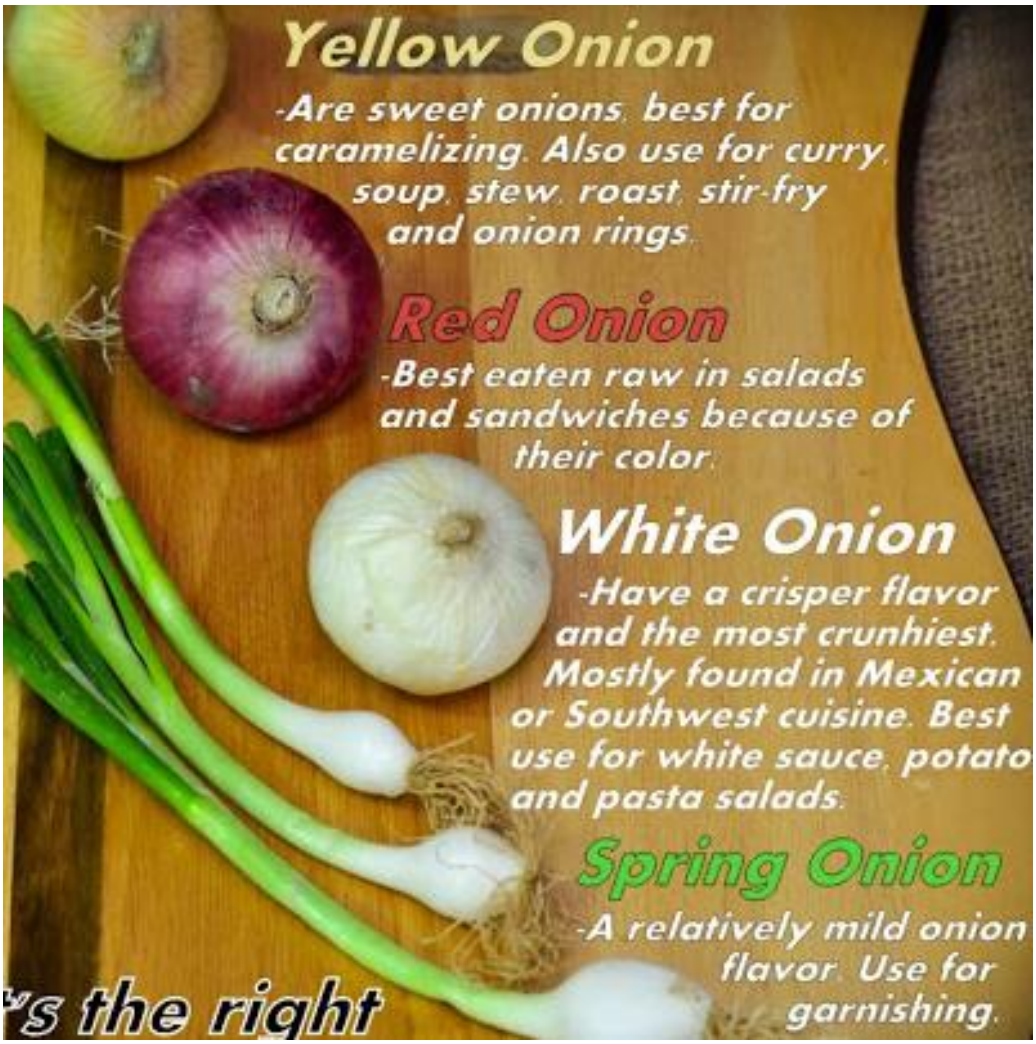
SWEET ONION - Best for frying, use for onion rings, gratins, and roasted vegetables

RED ONION - Best for eating raw, use for guacamole, pickled onions, sandwiches, salads

WHITE ONION - Crunchiest, sharpest zing, use for salsas, chutneys, stir fries

YELLOW ONIONS - Best all-around cooking onion, use for meat roasts, braised meat dishes, sauces, soups, stews

SHALLOTS - Milder and more subtle, use for vinegarettes, egg casseroles, garnishes

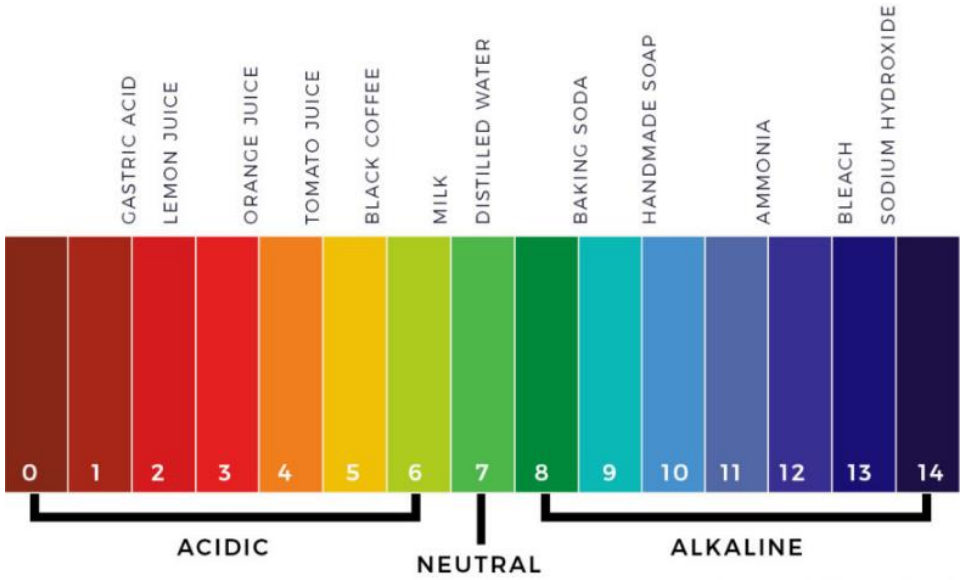


pH of onion (vegetable) is: - 5.5 to 6.5; it is acidity because its pH is below 7.

pH is a measure of hydrogen ion concentration, a measure of the acidity or alkalinity of a solution. The pH scale usually ranges from 0 to 14. Aqueous solutions at 25°C with a pH less than 7 are acidic, while those with a pH greater than 7 are basic or alkaline& 7 is neutral; only aqueous solutions have pH levels, vegetable oil has no pH value. Likewise, other oils such as animal and petrochemical oils also have no pH value. Fatty acids are organic molecules often found in foods, including vegetable oils.

The pH of pure water is 7. In general, water with a pH lower than 7 is considered acidic, and with a pH greater than 7 is considered alkaline. The normal range for pH in surface water systems is 6.5 to 8.5, and the pH range for groundwater systems is between 6 and 8.5. We can add normal water to reduce the acidity.

It is Sunnat of Prophet Muhammad (s.a.w) to mix acidic with Alkaline to make it neutral or less acidic that why He use eat dates with watermelon or cucumber or dry dates with little butter; so you can mix one acidic with alkaline; also it is Sunnat to drink honey mixed in water; also dates or raisins soaked in water over night & drink the syrup (sharbat). Remember do not soak dates & raisin together at one time; soak at separate time & drink.



- ***Calories of onion vegetable: -***100 gram gives 40 calories because it contains 89% water & 9% carbs, 1.7% fiber etc.
- ***Glycemic index & Glycemic load onion (vegetable): -*** The glycemic index of raw onion is 10 which is low GI and glycemic load of medium sized raw onion (approx. 75 grams) is only 1. So it is good for diabetic patients.

A food is considered to have a low Glycemic index (GI) if it is 55 or less; mid-range GI if 56 to 69 & high GI if 70 or more. *Glycemic index* is a number. It gives you an idea about how fast your body converts the carbs in a food into glucose.

A low Glycemic load (GL) is between 1 and 10; a moderate GL is 11 to 19; and a high GL is 20 or higher. For those with diabetes, you want your diet to have GL values as low as possible.

The glycemic load (GL) of food is a number that estimates how much the food will raise a person's blood glucose level after eating it. Glycemic load accounts for how much carbohydrate is in the food and how much each gram of carbohydrate in the food raises blood glucose levels.

- ***Gross health benefits of it: -***

It is best & helpful for heart diseases, heart health, skin, hair, nails, bones; increases digestion, reduces phlegm, helps in curing cough & cold, increase semen, libido, cleans the stomach, reduces cholesterol & triglycerides; helpful in jaundice; helpful when its juice is applied on alopecia (patchy hair fall), warts, white spots (its juice is used with salt); it is anti-inflammatory, antioxidant, boost immune system, good in controlling high blood pressure, prevents blood clots, increase appetite, improves taste. Its seeds oil is very beneficial in hair fall, dandruff, skin lesions & has lot of health benefits because it is rich in natural sulphur, improves fertility in male & female;

- ***Clinical pharmacology of it: -***

Minerals are also present in it like potassium etc which help in controlling blood pressure & are diuretic (increase urine) & trace elements like sulphur are also present which are good for skin, hair growth, also are natural antibacterial, antiviral, antifungal.

Flavonoids are an important non-nutritive component present in the onion. An example is quercetin. In general, flavonoids help improve blood circulation, stops the oxidation of low-density lipoproteins, a type of fat in the blood that causes arteriosclerosis, and blood clot.

Onion oil also forms part of the non-nutritive components. They are composed of several substances, amongst which thiosulfinate and allyl disulfide stands out. Essential oils are responsible for the onions typical odour and volatility & good for skin & hair & fight germ & bacterial.

Vegetable fiber is also present in onion. They have been attributed to onion's anti-diabetic action, and its diminishing effect on the absorption of cholesterol.

Enzymes are present in onion in rich amounts. Some of these enzymes present include diastase and oxidase, which both have an invigorating effect on the digestive process (i.e they help make digestion more easy and efficient).

Glycoquine, a vegetable hormone is present in onion. It helps reduce the blood's glucose level. Thus, explaining onion's anti-diabetic action.

Studies have proven that thiosulfinate, one of the onion's essential oil, is effective in stopping bronchial allergic reactions to asthma. This substance causes the dilation of the bronchial passage. The studies have also concluded that, the anti-allergenic effect and the dilating effect of the bronchial passage ways of the onion makes the eating of raw onion effective in cases of bronchial asthma.

Studies conducted by the National Cancer Institute of United States, found that those who eat more onions have a much lower risk of developing cancer. It shows that the onion has the capacity to neutralize carcinogens (cause cancer), and also prevent the development of tumor cells.

Onion help prevent arteriosclerosis and thrombosis, thus, improving blood circulation. Evidences have also shown those who eat onions have a lower risk of dying from a heart attack.

It facilitates the elimination of waste products from the body. This elimination can be in the form of an increase in urine production. Thus, those suffering from kidney related disorder such as kidney stones and renal failure should increase the consumption of onions in their diets.

- ***Modern uses of it: -***

1. For Asthma & lungs diseases: -

Take 5 slice of freshly cut onion, take half cucumber, put a pinch of baking soda, salt & black seeds on it; take 1 fig (dried or fresh); eat the fig first properly chewed followed by chew & grind the black seeds for little while followed by eating of onion, cucumber slowly properly chewed & drink 1 cup warm water on it. Do this once a day for 11 days followed by alternative 11 days followed by once a week, eat something of good odour to compact the bad odour of onion from mouth.

2. For weak digestion: -

Take 5 slice of freshly cut onion, 5 small of watermelon & apply 1 pinch of baking soda & salt on it & eat it twice a day on empty stomach for 3 days followed by once a day for 3 days followed by once week for 7 weeks.

3. For detox, to reduce cholesterol, to prevent heat diseases: -

Take 5 slice of onion, 3 clove garlic, 1 spoon of honey & 1 spoon of extra virgin olive oil, smash onion & garlic in olive oil properly & add honey mix all properly to make a paste, now take 1 cup of warm water mix the paste in it & drink it once or twice a week only lifelong.

4. For wounds, infections, alopecia (patchy hair fall): -

Take a small onion, 1 clove of garlic, 1 teaspoon of olive oil, crush & mix all & apply on the affect part of the body once or twice a day till complete relief, always prepare fresh.

- ***Contents/constituents of onion (vegetable): -***

All contents may not present in all types of it, because there are many varieties of it according to geographical regions & content may differ a lot as per cultivation, soil, seed, climate etc.

A good quality of onion contains little amount of amino acids mentioned in table below: -

The above ingredients are based on scientific study, means these has been identified, known & learnt by modern science, it does not mean that it contains only these ingredients; there may be many more ingredients which are yet to be discovered, learnt & known by modern science.

The details given below are based on natural ingredients found in onion.

Onion has been found to contain quercetin, fructose, quercetin-3-glucoside, isorhamnetin-4-glucoside, xylose, galactose, glucose, mannose, organo-sulfur compounds, allylsulfides, flavonoids, flavenols, S-alk(en)yl cysteine sulfoxides, cycloalliin, selenium, thiosulfinates, and sulfur and seleno compounds,

alliuocide, 6 types of cysteine, malic acid, citric acid, succinic acid, pyruvic acid, oxalic acid, tartaric acid, fiber, carbohydrate, calcium, potassium, little sodium, iron, vitamin C, D, A, B6, B9, B12 etc.

- ***Active ingredient of onion: -***

Allicin, quercetin, natural sulfur is the active principle of onion.

Onion	In mg.
Weight of onion 160 grams	160 gram
Tryptophan(mg) (% RDI)	22 (8%)
Threonine(mg) (% RDI)	34 (3%)
Isoleucine(mg) (% RDI)	22 (2%)
Leucine(mg) (% RDI)	40 (1%)
Lysine(mg) (% RDI)	62 (3%)
Methionine(mg) (% RDI)	3 (0%)
Cystine(mg) (% RDI)	6 (2%)
Phenylalanine(mg) (% RDI)	40 (5%)
Tyrosine(mg) (% RDI)	22 (3%)
Valine(mg) (% RDI)	34 (2%)
Histidine(mg) (% RDI)	22 (3%)
Arginine(mg)	166
Alanine(mg)	34
Aspartic acid(mg)	146
Glutamic acid(mg)	413
Glycine(mg)	40
Proline(mg)	19
Serine(mg)	34

- ***Allicin: -***

Allicin is a compound produced when garlic or onion is crushed or chopped. Available in dietary supplement form, it's been found to reduce inflammation and offer antioxidant benefits. Fresh garlic& onion contains an amino acid called alliin. When the clove is crushed or chopped, an enzyme, alliinase, is released. Alliin and alliinase interact to form allicin, which is considered the major biologically active component of garlic & onion.

Allicin was discovered in 1944 by Cavallito and Bailey and then Cavallito et al. first noted its potent antimicrobial activity. Allicin is not present in raw garlic& onion, but it is rapidly produced by the action of CS-lyase (allinase) on alliin. Allinase is activated by crushing or cutting the garlic cloves or onion. Allicin represents about 70% of the overall thiosulfinates present in it upon mechanical crushing. Mechanistic and pharmacokinetic studies of allicin and its derivatives raise the need for a labeled compound. Labeling of this volatile and unstable liquid requires delicate handling.

The allicin generated is unstable and quickly changes into a series of other sulfur-containing compounds such as diallyl disulfide. Allicin is part of a defense mechanism against attacks by pests on its plant. Allicin is garlic's defense mechanism against attacks by pests. When the garlic plant is attacked or injured it produces allicin by an enzymatic reaction. The enzyme alliinase converts the chemical alliin to allicin, which is toxic to insects and microorganisms.

Allicin is an oily, slightly yellow liquid that gives garlic its unique odor. It is a thioester of sulfenic acid and is also known as allyl thiosulfinate. Its biological activity can be attributed to both its antioxidant activity and its reaction with thiol-containing proteins. Produced in garlic cells, allicin is released upon disruption,

producing a potent characteristic scent when garlic is cut or cooked. Allicin has been studied for its potential to treat various kinds of multiple drug resistance bacterial infections, as well as viral and fungal infections, anti-inflammatory, antioxidant, cardio-protective etc.

- ***Quercetin: -***

It is a plant flavonol from the flavonoid group of polyphenols; it is bitter in taste.

Main sources of quercetin: -

Red onion, green tea, apples, ginko biloba, grapes etc.

Basic pharmacokinetics of quercetin (based on human intake in natural food products): -

Its absorption, metabolism & excretion are yet not known & are under research.

Basic clinical pharmacology of quercetin: -

It is good for heart diseases, coronary heart disease, prevents cancer, arthritis, bladder infection, diabetes; it is anti oxidant, anti inflammatory, reduces benign prostatic hyperplasia, cholesterol, blood pressure, asthma, symptoms of rheumatoid arthritis.

- ***Dietary fiber: -***

It is an eatable part of vegetables & fruit; our body cannot digest it just passes the small intestines & colon & excrete in stools; it is of two types 1) soluble fiber 2) insoluble fiber.

Soluble fiber dissolve in water & form a gel like material & helps in controlling blood cholesterol & blood glucose; it is found in apple, carrot, barley, oats, peas, beans watermelon etc.

Insoluble fiber do not dissolve & promotes excretion & increase bulk of the stool thus relief constipation & helps in elimination of toxins also. It is found in wheat flour, beans, cauliflower, potato, green beans, watermelon, beetroot, beet leaves etc.

This is the reason it is helpful in constipation conditions, it can be eaten in pregnancy to relief constipation and get other benefits of it also.

Basic pharmacokinetics of dietary fiber (based on human intake in natural food products): -

Soluble fibers get dissolve in water & become a gelatinous substance; do not get digested; it helps to slow the digestion & help the body to absorb vital nutrient from eaten food.

Insoluble fibers do not dissolve in water but remain in fibrous form, and do not get digested; it helps the food pass through the digestive system and increase the bulk of stool & eliminate toxins also.

Basic clinical pharmacology of dietary fiber: -

It helps in slow down the digestive process thus gives a good control in blood glucose, improves insulin sensitivity, reduces risk of diabetes, maintains weight, helpful in obesity, reduces blood pressure, reduces cholesterol, reduces inflammation, reduces risk of heart disease, relieves constipation thus helpful in piles, fistula & other rectal disorders & disease, improves bowel movement thus improves bowel health, slowdowns the digestion thus improves quality of digestion, reduces risk of many types of cancer.

- ***Malic acid: -***

It is a natural organic substance present in many fruits & plants; it is an alpha-hydroxyl acid (a natural acid) commonly used in skin care products & has many health benefits.

Main sources of malic acid: -

It is present in watermelon, quince, apricot, banana, grapes, quince, kiwi, orange, straw berries, mango, luchees, apple, pear, cherries, quince etc.

Basic pharmacokinetics of malic acid (based on human intake in natural food products): -

Its absorption, metabolism & excretion are not known yet & are under research.

Basic clinical pharmacology of malic acid: -

It is anti-aging, removes dead skin cells, treats acne, promotes skin hydration, improves complexion, boost sports performance, promotes energy production, increases exercise capacity, removes muscles fatigue, reduces muscular pain & muscle weakness, increases mineral absorption thus anti arthritis, increases digestion, chelator of aluminum, it is also a body detox.

Malic acid has low pH & can aid in stomach digestion when the body does not produce naturally hydrochloric acid for digestion; it acts on quick absorption, helps the whole digestive system, softens the gall stones, dilates the bile duct & act on excretion of gall stones.

- ***Citric acid, succinic acid present in onion: -***

These acids are present naturally in all types of honey & it prevents honey bee colony (hive) from many mite infections like Varroa jacobsoni, one of the most common and dangerous mites in colonies of honey bee and can cause the death of untreated bee hives in a few years. They have anti bacterial, anti viral & antifungal properties. Succinic acid is a dicarboxylic acid with the chemical formula $(CH_2)_2(CO_2H)_2$. The name derives from Latin succinum, meaning amber.

- ***Sulfur: -***

Sulfur is an essential element for all life, but almost always in the form of organo-sulfur compounds or metal sulfides. Three amino acids (cysteine, cystine, and methionine) and two vitamins (biotin and thiamine) are organo-sulfur compounds. Many cofactors also contain sulfur, including glutathione, thioredoxin, and iron–sulfur proteins. Disulfides, S–S bonds, confer mechanical strength and insolubility of the protein keratin, found in outer skin, hair, and feathers. Sulfur is one of the core chemical elements needed for biochemical functioning and is an elemental macronutrient for all living organisms. Sulfur (in British English, sulphur) is a chemical element with the symbol S and atomic number 16. Elemental sulfur is a bright yellow; Sulfur is the third most abundant chemical in the human body. The element is also found in a number of foods such as garlic, onions, eggs, and protein-rich foods. Sulfur is necessary for the synthesis of the essential amino acids cysteine and methionine. It is helpful in osteoarthritis, muscles soreness, hair fall, antibacterial, antiviral, dandruff etc.

- ***Pyruvic acid: -***

Pyruvicacid ($CH_3COCOOH$) is the simplest of the alpha-keto acids, with a carboxylic acid and a ketone functional group. When onions are crushed, the alliinase enzyme hydrolyses the ACSOs to form pyruvicacid, ammonia, and volatile sulphur compounds. This reaction is completed within 6 min (Schwimmer and Weston, 1961, Whitaker, 1976). Thus, the stable pyruvicacid has been used as an indicator of onion pungency. Natural occurrence of it is in Asparagus, beef, sake, Virginia tobacco, wheat bread. Pyruvic acid is transported into the mitochondria via a monocarboxylic acid co-transporter and is then metabolized by PDH into acetyl-CoA. Metabolism of acetyl-CoA follows the pathway. It is useful in obesity, acne, skin complexion.

- ***Cysteine: -***

Cysteine is a semi-essential proteinogenic amino acid; 100 grams of a raw **onion** contains 0.004 g **cysteine**; It is helpful in respirative diseases, heart diseases, brain diseases, it is antioxidant, improves fertility in male & female. In onion 6 types of cysteine are present.

- ***Alliuocide: -***

A new flavonoid named alliuocide was isolated by Mohamed from the ethyl acetate fraction of onion. This molecule showed in vitro α-amylase inhibitory activity and radical scavenging potency.

- ***Seleno: -***

Garlic (Allium sativum) and onion (Allium cepa) are widely known for their biological properties but are far from having revealed all of their secrets even if the compounds involved in the biological mechanisms, flavenols, sulphur and seleno compounds have been identified. The beneficial effects of garlic& onion on health, includes protection against cardiovascular diseases and cancers.

- ***Thiosulfinate: -***

Thiolsulfinates are also named as alkanethiosulfinic (or arenethiosulfinic) acid esters. They are the first member of a family of compounds containing an oxidized disulfide bond; Thiosulfinates are the best studied compounds arising from Allium species and most of our knowledge of their structure and biogenesis is due to Block; Thiosulfinates are very unstable compounds and give rise to further rearrangements leading to a wide variety of derived sulfur compounds.

- ***Allyl sulfide: -***

If the onion is ingested, these compounds are eventually broken down into allyl methyl sulfide, shown below, which can be removed from the body by exhalation – giving rise to the characteristic 'onion breath'; It is organo-sulfur in garlic & onion & related to odour of both & exhale with its odour. it promotes health & is under research.

- ***Cycloallin: -***

It is a new isolated amino acid; it is found in onion & it removes clots in the blood vessel along with other compounds present in onion. It is under research.

- ***Mannose: -***

It is a type of sugar; Mannose is important in human metabolism, especially in the glycosylation of certain proteins.

- ***Glucose: -***

It is among simple type of natural sugar present in fruits & vegetables; it is a source of energy for our body & related to many function & digestion.

- ***Galactose: -***

Galactose is a simple sugar, which belongs to simple carbohydrates. Galactose is composed of the same elements as glucose, but has a different arrangement of atoms; it is a source of energy for our body & related to many function & digestion.

- ***Sugar (fructose): -***

Sugar present in beetroot is fructose; (but diabetic patients should not eat much of it).

Main sources of fructose: -

It is present in watermelon, honey, banana, apple, mango, cherry, strawberry, orange, kiwi, pears, pomegranate, apricots, carrots, yogurt, bread, lemon, lime, green beans, beetroot etc.

Basic pharmacokinetics of fructose (based on human intake in natural fruit & food products): -

Fructose digestion begins in the small intestine (more in upper jejunum) via active transport or facilitated transport (not known properly). Our body cannot absorb intact polysaccharide molecules. Therefore, if fructose is present in the form of sucrose, sucrase, an enzyme, must first break up sucrose into separate glucose and fructose components. Single fructose molecules then enter the lining of the small intestine through a special channel and exit out the other side into the bloodstream, once in the bloodstream, fructose travels with all other absorbed nutrients to the liver for metabolism and processing.

Metabolism: -

Fructose metabolism occurs entirely in the liver. Through a complicated process called fructolysis, fructose undergoes several chemical and structural changes with the help of aldolase B (an enzyme in the liver).

Extra fructose needs to be changed into glycogen by liver & stored in liver, once the storage is full in liver then liver convert it into triglycerides & triglycerides are further converted by liver into very low-density lipoprotein (VLDL) & stored in fat cells & muscles. Excessive fructose is excreted in urine.

Basic clinical pharmacology of fructose: -

Fructose has low glycemic index & results in moderate release of insulin in the blood stream relative to glucose & sucrose; fructose gives the least dental caries among other types of sugars, fructose is more sweeter than other types of sugar; it does not raises blood sugar much as glucose does, it is used as sources of energy in the body, excessive intake of it may cause fatty liver, metabolic disorder, blood pressure, increase lipids, increase in uric acid level, increase in free radicals etc.

- ***Xylose: -***

Xylose is included in dietary carbohydrates. It is part of sugar composition of fruits, cereals, bread and vegetables like potato, peas and carrots. It is present in its free form, or can appear as part of glycosidic composition associated with flavonoids, catechins, anthocyanins etc.

- ***Carbohydrate: -***

It is a macronutrient needed by the body, the body receives 4 calories per 1 gram of it; carbohydrates include sugar, glycogen, starch, dextrin, fiber & cellulose that contain only oxygen, carbon & hydrogen. It is classified in

simple &complex; simple carbs are sugar & complex carbs are fiber & starch which take longer to digest. It is basic source of energy for our body.

Main sources of carbohydrates: -

It is present in watermelon (little), potato, sweet potato, bread, oats, butter, white rice, whole grain rice, pasta, lentils, banana, pineapple, quince, cucumber etc.

Basic pharmacokinetic of carbohydrate (based on human intake in natural food products): -

Its digestion begins in mouth; salivary glands releases saliva & salivary amylase (enzyme) which begins the process of breaking down the polysaccharides (carbohydrates) while chewing the food; now the chewed food bolus is passed in stomach through food pipe (esophagus); gastric juice like HCL, rennin etc & eaten material are churned to form chyme in the stomach; the chyme now is passed little by little down into duodenum, pancreatic amylase are released which break the polysaccharides down into disaccharide (chain of only sugars linked together); now the chyme passes to small intestine, in it enzymes called lactase, sucrase, maltase etc breakdown disaccharides into monosaccharide (single sugar) & absorbed in upper & lower intestines, through villi present in small intestine & send into liver through venous blood present into portal veins, as per bodies need it is releases in the blood stream & pancreas release insulin to use it as source of energy for the body, & extra is stored is converted into glycogen by liver & stored in liver & little is stored in muscles& tissues. Liver can reconvert glycogen in to sources of energy if body lacks for other source of energy, the undigested carbohydrates reaches the large intestine (colon) where it is partly broken down &digested by intestinal bacteria, the remains is excreted in stools.

Clinical pharmacology of carbohydrates: -

Carbohydrates are main sources of body energy, it helps brain, kidney, heart, muscles, central nervous system to function, it also regulates blood glucose, it acts on uses of protein as energy, breakdown of fatty acids & prevent ketosis. If we eat less carbohydrate it may lead to hypoglycemia, ketosis, frequent urination, fatigue, dizziness, headache, constipation, bad breath, dehydration etc.

Excessive intake of carbohydrates may lead to vascular disease, atherosclerosis (leads to narrowing of arteries, stroke, diabetes, obesity, fatty liver, blood pressure etc.

- ***Vitamin A: -***

It is a fat soluble vitamin; it is group of unsaturated organic compound that includes retinol, retinal, retinoic acid & several provitamin A carotenoid. There are 2 types of vitamin A, 1) Vitamin A: - found in meat, poultry, fish & dairy products; 2) Provitamin A: - found in fruits, vegetables, plants; beta carotene is common type of provitamin A; it is an antioxidant, reduces wrinkles & repairs the skin damages; it is available in the market as tretinoin in tablets & creams to heal acne.

Main sources of vitamin A: -

It is present in watermelon, fish oil, carrot, green leafy vegetables, citrus fruit, sweet potato, spinach, kale, quince, pumpkin, grapes etc.

Basic pharmacokinetic of vitamin A (based on human intake in natural food products): -

It is absorbed in jejunum mainly, little through skin; metabolism is in liver & excreted in urine & stools, it is conjugated with glucuronic acid & then changed into retinal & retinoic acid; retinoic acid is excreted in stool, mainly. It is stored primarily as palmitate in Kupffer's cells of liver, normal adult liver stores sufficient amount of it which is enough for 2 years for the body, little is stored in kidneys, lungs, adrenal glands, fats, retina; it is excreted in urine & stools.

Clinical pharmacology of vitamin A: -

it is needed by the body for vision and maintains eye health speacially retina; it prevents night blindness; it helps in normal reproduction of cells thus prevents cancer; it is required for proper growth & development of embryo throughout the pregnancy period, it is good for skin, supports immune function; helps the heart, kidneys & lungs to work properly.

- ***Vitamin C: -***

It is also called as Ascorbic acid; it is an essential water soluble vitamin, very much needed by the body for many functions & absorption etc.

Main sources of vitamin C: -

It is present in watermelon, citrus fruit, broccoli, cauliflower, sprouts, capsicums, papaya, strawberries, spinach, green & red chilies, cabbage, leafy vegetables, tomato, cereals, quince, cucumber etc.

Basic pharmacokinetic of vitamin C (based on human intake in natural food products): -

It does not need to undergo digestion, 80 to 90% of it eaten is absorbed by intestine cell border by active transport & passive diffusion & through ion channels it enters the plasma via capillaries. It is very little stored in adrenal glands, pituitary gland, brain, eyes, ovaries, testes, liver, spleen, heart, kidneys, lungs, pancreas & muscles. All together body can store 5 grams of it & we need 200mg/day in order to maintain its normal level & uses, but old, disease person, smokers & alcoholic need more daily value. It is excreted in urine in the form of dehydroascorbic acid changed by liver & kidneys both, but unused vitamin C is excreted intact.

Basic clinical pharmacology of vitamin C: -

It prevent cough & cold, repairs tissue, acts as an enzyme for curtain neurotransmitter, important for immune function, it is a powerful antioxidant (donates electron to various enzymatic & non-enzymatic reactions); body prepares collagen with the help of vitamin c; it is also helpful in Alzheimer's, dementia, acts on iron absorption, it protects the body from oxidative damages, reduces stiffness of arteries, reduces tendency of platelets to clump each other, improves nitric oxide activity (dilatation of blood vessels) thus prevents high blood pressure & heart disease, also prevent eye disease, reduces risk of cataract, prevents the lining of lungs & prevents lung disease, it is a natural antihistamine (anti allergy), eliminates toxins from the body. Deficiency of it causes Scurvy disease (brown spots on skin occurs, swelling of gums, bleeding from all mucous membrane, spots are more on thighs & legs, the person looks pale, feel depressed, cannot move, loss of teeth, suppurative wounds occur.

- ***Vitamin D: -***

It is a fat soluble vitamin; it is a group of fat soluble secosteroids responsible for increasing intestinal absorption of calcium, magnesium, phosphate etc.

Main sources of vitamin D: -

It is present in olive oil, fish, liver, egg yolk, milk, salmon oil, orange, cereals, soy milk, legumes etc.

Basic pharmacokinetics of vitamin D (based on human intake in natural food products): -

It is absorbed in small intestines; it is mainly excreted in stools. All forms of vitamin D are biological inactive (body cannot use it directly) & get activated in liver & kidney by some enzymes; it is mainly of 2 types, 1) Vitamin D3 (cholecalciferol) 2) Vitamin D2 (ergocalciferol). Both can be ingested from diet.

Vitamin D3 is naturally synthesis from cholesterol by skin on sun exposure (UVB short radiations). It is converted in liver into Calcifediol (25-hydroxycholecalciferol) & kidney converts it into Calcitriol & this is biologically active (usable by the body). Vitamin D2 is converted in liver into (25-hydroxyergocalciferol).

Basic clinical pharmacology of vitamin D: -

It increases absorption in intestines of calcium, magnesium, phosphate & many other minerals; it acts on metabolism of calcium, phosphate thus promotes bone health & growth, promotes remodeling of bones in children; it reduces inflammation, improves cell growth, neuromuscular functions, immune function, prevents osteoporosis (pores in bones), rickets in children. Calcitriol binds with vitamin D receptors (VDR) which are mainly present in the nuclei of target cells. Its deficiency may cause rickets (mainly in children), weak bones, weakness in muscles, fatigue, headache, blood pressure, inflammation in mouth, skin pigmentations, obesity etc.

- ***Vitamin B6: -***

It is also called as pyridoxine; it is involved in many aspects of macronutrients metabolism; it is present in many food products naturally.

Main sources of vitamin B6: -

It is present in watermelon, quince, chicken, bread, egg, vegetable, soyabean, whole grain cereals, brown rice, fish, legumes, beef, nuts, beans, liver, citrus fruits, starchy vegetables, potato etc.

Basic pharmacokinetic of vitamin B6 (based on human intake in natural food products): -

It is absorbed in small intestines, but before absorption a phosphate group has to be removed making vitamin B 6 in free form & absorbed by passive transport, now reaches liver via portal vein, in liver to get metabolized & flown into the blood stream it is bound with albumin & some are taken up by red blood cells, once getting in blood it can function & promote health & it is excreted mainly in urine & little is excreted in stools, it is very little stored in tissues, muscle tissues, liver, brain, kidneys, spleen.

Basic clinical pharmacology of vitamin B6: -

It is needed for proper development & function of brain in children; it is needed for neurotransmitter, histamine, haemoglobin synthesis & function. It serves as coenzyme (cofactor) for many reactions in the body, it is the master vitamin for processing amino acids & some hormones, it is needed by the body to prepare serotonin, melatonin & dopamine, it is better to intake it during treatment of tuberculosis. It supports adrenal glands to function; it acts as a coenzyme in the breakdown & utilization of fats, carbohydrates, protein, it is important for immune system, it helps in treatment of nerve compression like carpal tunnel syndrome, premenstrual syndrome, depression, arthritis, high homocysteine level, diabetes, asthma, kidney stones etc.

Its deficiency causes seborrheic dermatitis (eruption on skin), atrophic glossitis with ulceration, conjunctivitis, neuropathy, anaemia etc.

- ***Folate (vitamin B9): -***

Folate is an essential micro nutrient, it is a natural form of vitamin B9, it serves many important functions of the body, it plays an important role in cell growth & formation of DNA, RNA & other genetic material & helps in treating many diseases; it name is derived from Latin Word Folium, which means leaf, leafy vegetables have it in good amount; Folic acid is a synthetic form of vitamin B9.

Main sources of folate: -

It is present in watermelon, quince, dark green leafy vegetables, fruits, nuts, beans, dates, seafood, egg, dairy products, meat, chicken, legumes, beetroot, citrus fruits, broccoli, spinach, cereals, cucumber etc.

Basic pharmacokinetic of folate (based on human intake in natural food products): -

Its absorption is complicated because folate present in food are of many different forms, some of which cannot be absorbed until broken down by intestinal enzymes; it is not absorbed more than 50%; dietary folate contains glutamate that need to separate it from glutamate before absorption starts; It is absorbed in duodenum & jejunum, after absorption it is converted into tetrahydrofolate (the active form of folate), than a methyl group is added to it to form methyltetrahydrofolate; now the body uses it for various functions & metabolism; the body can store folate 20-70mg in liver which is enough for 3 -6 months for the body; it gets excreted in urine & little in stools & bile.

Basic clinical pharmacology of folate: -

It is needed by the body to make DNA, RNA & other genetic material; it prevents many disease & conditions like anaemia, stroke, cardiac diseases, cancers, neurological diseases, macular degeneration (eye disease), palpitation, sores in mouth & tongue, hair fall, graying of hair. It is important in fertilization in male & female, essential during pregnancy to prevent neural tube defect in embryo (it is needed more), it protect us from free radicals & oxidation thus prevent cancers, it is essential in red blood cells formation, reduces high levels of homocysteine.

Its deficiency may cause anaemia, tiredness, palpitation, breathlessness, hairfall, neural tube defect in baby during pregnancy etc.

- ***Vitamin B12: -***

It is called as Cobalamin, it is water soluble, it is involved in metabolism of every cell of body, it is a cofactor in DNA synthesis, myelin, fatty acids & protein, it is important for nervous system, it acts on red blood cell maturation; it is very less present in vegetables. When we eat animal source for it, B12 is protein bounded. Our body cannot produce it we need to consume it in food sources.

Main sources of vitamin B12: -

It is present in fish, meat, egg, milk, dates, organ like liver, kidney, olive fruit etc.

Basic pharmacokinetics of vitamin B12: - (based on human intake in natural food products):

It is absorbed in ileum (small intestine), when humans eat animal food the B12 is protein-bound. When the protein-B12 complex reaches the stomach, the stomach secretes acids and enzymes that detach the B12 from the protein. Then in a process unique to B12, another protein, R-protein (aka cobalophilin, haptocorrin, and transcobalamin picks up the B12 and transports it through the stomach and into the small intestine. R-protein is found in many fluids in the human body including saliva and stomach secretions. The stomach cells also produce a protein called intrinsic factor (IF), which travels to the small intestine. When the corrinoid-R-protein complex gets to the small intestine, the corrinoid is liberated from the R-protein by enzymes made by the pancreas. Of the liberated corrinoids, only the cobalamins attach to intrinsic factor. Intrinsic factor then carries the cobalamins to the last section of the small intestine, the ileum. The cells lining the ileum contain receptors for the cobalamin-IF

complex. The cobalamin-IF complex protects the cobalamin against bacterial and digestive enzyme degradation. The IF-receptor also ensures that cobalamins will be given priority for absorption over non-cobalamin corrinoids. In addition to the IF mechanism, passive diffusion normally accounts for 1-3% of B12 absorbed when obtained through normal food sources. Some inactive B12 analogues are most likely absorbed through passive diffusion. It is metabolized in liver & excreted in urine. It is stored in liver for years mainly.

Basic clinical pharmacology of vitamin B12: -

It helps in formation of Red blood cells, prevent anaemia, prevent birth detect, promotes bone health, prevent osteoporosis, reduces risk of macular degeneration in eyes, improves mood & prevents depression, help nerve function & promote nervous health, boost energy, improves heart heath, nails, hairs, skin, memory, hormonal balance. It acts on wound healing, sooner recovery, ulcers, mouth ulcers etc.

Its deficiency causes anaemia, stress, weakness, stress, fatigue, delay wound healing, pain in nerves & tissues, joints, paleness, numbness in palms, feet etc. Diabetes & acidity medication reduces absorption of it in stomach & may lead to deficiency.

- ***Potassium: -***

It is a mineral with symbol K & atomic number 19, it is an essential mineral which body cannot prepare; it is necessary for heart, kidney & other organs to function, its low level in body is called as hypokalemia & high level is called as hyperkalemia; it is mostly present inside the cells (intracellular); normal blood range is 3.5 to 5.0 milli equivalents per/liter (mEq/L).

Main sources of potassium: -

Potassium is naturally present in banana, orange, dates, raisin, broccoli, milk, chicken, sweet potato, pumpkin, spinach, watermelon, coconut water, white & black beans, potato, dried apricot, beetroot, pomegranate, almond, quince, cucumber etc.

Basic pharmacokinetics of potassium (bases on human intake in natural food products): -

It is absorbed in small intestines by passive diffusion; it is stored mostly inside the cell, little in liver, bones & red blood cells. 80 to 90% potassium is excreted in urine & 5 to 20% is excreted in stools, sweat.

Basic clinical pharmacology of potassium: -

It is a mineral belongs to electrolytes of the body; it conducts electrical impulses throughout the body & assists blood pressure, normal water balance, muscle contraction, nerves impulse, digestion, heart rhythm, maintain pH balance. It is not produced in our body so we need to consume it through eating; Kidneys maintain normal level of it in the body by excreting excessive amount of it in urine or reabsorb it if the amount is less in the body so that the body may reuse it. Its deficiency may cause weakness, low blood pressure, constipation, nausea, vomiting etc.

Its normal amount in body keeps blood pressure normal; water balance in body normal; prevents heart disease, stroke, osteoporosis, kidney stone etc.

- ***Sodium: -***

Here we are learning natural sodium, its symbol is Na & atomic no. 11; it is not produced in the body we need to take it in food sources; it is an important & essential mineral on which our body functions; it regulates blood pressure, blood volume etc.

Main sources of sodium: -

Excessive intake of sodium should be avoided; cucumber has very less amount of sodium; vegetables & fruits have less sodium in them which is good for the body. It is present in beans, meat, fish, chicken, chili, bread, rolls, milk, celery, beetroot etc.

Basic pharmacokinetic of sodium (based on human intake in natural food products): -

It is absorbed in ileum by active sodium transport because it is impermeable & in jejunum absorption takes place via mediated active transport & depends on levels of water, bicarbonate, glucose, amino acids etc; its absorption plays an important role in the absorption of chloride, amino acids, glucose & water; similar mechanism are involved in the reabsorption of it in kidneys when its level in the body falls. It is excreted mainly in urine, little in sweat & stools. It is stores in bones & dissolved in various body fluids.

Basic clinical pharmacology of sodium: -

It is amongst the essential electrolyte within the body, it remains in extracellular fluid (outside the cell) mainly, it carries electrical charges within the body, kidney maintain its normal level in the body, normal level is 135-145 milli-equivalent per liter (mEq/L), it is not produce in the body, it acts on muscles contraction, nerve cells,

regulates blood pressure, blood volume; it takes part in every function of the body mostly, its low level in body is called as hyponatremia, it is found more in older aged, kidney disease, heart disease, hospitalized patient, this condition may cause brain edema, low blood pressure, fatigue, tiredness etc; its high level in the body is called as hypernatremia may cause increase in blood pressure, thirst, confusion, muscle twitching or spasm, seizures, weakness, nausea, loss of appetite, swelling in body etc.

- ***Calcium: -***

It is natural essential mineral for the body, it is among the electrolytes of the body; its symbol is Ca & atomic no. 20.

Main sources of calcium: -

It is present in watermelon, quince, milk, banana, cheese, green leafy vegetables, soya beans, nuts, fish, meat, egg, bread, flour, yogurt, almonds, kale, soybean, spinach, cucumber etc.

Basic pharmacokinetics of calcium (based on human intake in natural food products): -

Calcium is absorbed in duodenum & upper jejunum (when calcium intake is low) by transcellular active transport process, this depends on action of calcitriol & intestinal vitamin D receptors & when calcium intake is high, absorbed by paracellular passive process throughout the length of small intestine by 3 major steps, entry across the brush border, intracellular diffusion via calcium-binding protein & extrusion; Vitamin D is necessary for absorption of calcium, also vitamin C, E, k, magnesium & exercise increases the absorption of calcium. Also the level of calcium is regulated by calcitonin released by thyroid gland it reduces calcium level in blood when it is excessive & increases the excretion of calcium via kidneys; Parathyroid hormones (PTH) released by parathyroid gland increases the blood level of calcium when body need it or calcium is less in blood & promotes reabsorption of it in kidneys (calcitonin & PTH both have opposite function). Intestines can absorb 500 to 600 mg of calcium at a time; it is mostly stored in bone tissues & teeth & excreted in stool & sweat & little in urine depended upon the level of it in blood. Also estrogen act on transport of blood calcium in bones thus women mostly suffer from osteoporosis after menopause.

Basic clinical pharmacology of calcium: -

Calcium acts on bone health, communication between brain & other parts of the body, muscles contraction, blood clotting; it is a co-factor for many enzymes, it relaxes the smooth muscles & blood vessels; it maintains heart rhythm, muscles function; it is more needed in childhood & deficiency of it in childhood may cause convulsions (seizure); Excessive level of it in blood is called as hypercalcemia & may lead to kidney stone formation, heart attack, stroke, loss of appetite, excessive urination, memory loss etc; its low level in blood is called as hypocalcemia & may lead to cramps in the body, weak bones, weak teeth, numbness, tingling etc.

Contraindication: -

Sarcoidosis, excessive level of calcium in blood, very severe constipation, kidney stones, increased activity of parathyroid gland etc. Hypersensitivity of calcium, severe cardiac diseases, hypercalcemia, hypercalciuria, severe kidney stones etc.

- ***Iron: -***

It is an essential mineral for our body; its symbol is Fe & atomic no. 26; it is an important component of heamoglobin (heamoglobin binds oxygen in lungs & supply it to whole body, it is oxygen carrier).

Main sources of iron: -

It is present in watermelon, quince, meat, dates, spinach, egg, nuts, dark leafy green vegetables, broccoli, pumpkin seeds, chicken, legumes, fish, banana, cabbage, kidney, almonds, cucumber etc.

Meat is the best source of iron; it provides Fe+2 directly which can be transported from intestine to blood steam through Fe+2 transporter ferroportin (this binds with transferring & delivered into tissues).

Basic pharmacokinetics of iron (based on human intake in natural food products): -

The absorption of iron is not known fully; about only 10% of iron taken in food is absorbed; it is absorbed in duodenum & upper jejunum mainly & at the end part of ileum; low pH is needed for its absorption, after absorption it get bind to transferring (each transferring can carry 2 atoms of iron); ceruloplasmin (protein) also helps in binding of iron; Hepcidin a hormone produced by liver is released when iron stores are full & inhibits iron transport & binding, thus reduces the absorption of iron; vitamin C & copper enhances iron absorption.

Storage of iron: -

Iron is stored in liver (in hepatocytes & kupffer's cells) kupffer's cells play an important role in recycling body iron, they ingest aged RBC liberate iron for it & reuse by breaking down heamoglobin. Little iron is stored in liver, heart, & kidneys in form of ferritin also little in bone marrow, spleen.

Excretion of iron: -

The body does not possess a physiological mechanism for regularly eliminating iron from the body because most of it is recycled by liver cells; iron is lost within cells, from skin & interior surface of the body (intestines, urine, breathe).

Basic clinical pharmacology of iron: -

It is an important component of Haemoglobin (heamoglobin bind oxygen in lungs & supply it to whole body); iron is beneficial for nails, hair, skin etc; it acts on blood production, its deficiency causes Anaemia (low haemoglobin level in blood) (this causes reduced in oxygen carrying capacity & supply of it); most of the iron is present in haemoglobin, it consists of one heme (iron), one protein chain (globin) this allows it to bind & load oxygen from the lungs & supply it to whole body.

Unbounded or free iron is highly destructive & dangerous it can trigger free radical activity which can cause cell death & destroy DNA.

- ***Selenium: -***

It is an essential trace mineral; it is micro nutrient helpful to our body; its symbol is Se & atomic no. 34.

Main sources of selenium: -

It is present in watermelon, fish, nuts, beef, chicken, mushroom, egg, grains, garlic, grapes etc.

Basic pharmacokinetics of selenium (based on human intake in natural food products): -

It is mainly absorbed in duodenum & proximal jejunum by active transport process; Dietary selenium is in 2 forms organic (selenoimethionine) it is 90% absorbed & inorganic (selenite) it is 50% absorbed; after absorption it is send in liver via portal veins, liver turns it into selenite & then is bound with selenoproteins & send into blood stream, gets in RBC, muscles, tissues etc; it is not distributed evenly in the body, liver has more of it; Vitamin E & other vitamins increases its absorption & both work as an anti-oxidant. Natural selenium remains in the body for less than 24 hours; it is stored in amino acid in skeletal muscles, little in liver, kidneys & pancreas; it is primarily excreted in urine, stool & expired in air via lungs very little in sweat & semen.

Basic clinical pharmacology of selenium: -

It is important for many body functions, immune system, fertility (both male & female); it contributes in thyroid hormone metabolism, DNA synthesis; it protects the body from oxidative damages & infection, it is found in tissues, skeletal muscles; it helps testies & seminal vesicles in their function; it reduces the risk of miscarriages, liver disease, cancer, asthma, cardio vascular disease; deficiency of it causes pain in muscles & joints, weaken the hair, nails, white spots on nails are found etc.

Natural oxalate (oxalic acid): -

It is present in many types of plant, it is an organic compound found in leafy vegetables, fruits, nuts, seeds etc. In plants it usually bounds to minerals forming oxalate. The term oxalic acid & oxalate are used interchangeable in nutritional science.

Main sources of natural oxalate: -

It is present in beetroot leaves (chard leaves), beetroot, carrot, spinach, sweet potato, turnip leaves, potato, apple, strawberry, green beans, broccoli, apricots, fig etc.

Basic pharmacokinetics of oxalate (bases on human intake in natural food products): -

In the human body some of the eaten oxalate is broken down by bacteria before it combines (mainly) with calcium & iron in colon & in kidneys (also in urinary tract) to form crystals & is excreted in urine as minute crystals (little is excreted in stool also) if taken in large quantity can cause kidney stones.

Also when fat is not absorbed properly, the fats binds with calcium and leaves oxalate behind, this oxalate is taken up by kidneys to excrete it; it also prevents absorption of calcium & other minerals; Presence of prebiotic can effect oxalic acid excretion. Our body makes oxalates as an end product of protein, vitamin c etc metabolism. It is excreted in urine & stool. Oxalate present in food is soluble & insoluble, insoluble bind with calcium or other molecules that makes it much harder to absorb; soluble do not bind with other molecules & is easily absorbed. Absorption of it differs among people, for some, oxalate is largely broken down in the intestines & eliminate without causing issues; in some, large amount of oxalate is absorbed; & in some, leaky gut can increase the

absorption of it & the needle shaped oxalate crystals can perforate the mucus membrane damaging the cells of intestine & cause more leakiness.

Leaky gut is also called as increased intestinal permeability, it is a condition in which many things can pass through the intestinal wall, and this occurs due to breach in intestinal wall or damaged cells, things can pass through their gasps (breach).

Excessive oxalate accumulates in crystal form in many parts of the body like joints, muscles, kidneys etc.

Basic clinical pharmacology of oxalate: -

It reduces absorption of some minerals because it binds with some mineral in the intestine, if taken in larger amount causes kidney stones, autism, vaginal pain etc; we should drink lot of water to avoid excessive oxalate collection in the body & to flush out; its benefits in human body is under research.

- ***Tartaric acid: -***

It is a white crystalline organic acid, naturally present in many plants, it is an alpha-hydroxy-carboxylic acid; it is an anti scarbutic & anti septic.

Main sources of tartaric acid: -

It is present in quince, grapes, apricot, avocados, apple, tamarind etc.

Basic pharmacokinetics of tartaric acid (based on human intake in natural food products): -

It is mostly metabolized by bacteria present in intestines (primarily in large intestine-colon); only 15 to 20 % of consumed tartaric acid is excreted in urine unchanged. Its absorption, metabolism & excretion are not known yet & are under research.

Basic clinical pharmacology of tartaric acid: -

It is an anti oxidant & anti inflammatory, it improves immune function, brings wellness in body, improves glucose tolerance, reduces blood glucose in diabetes, improves digestion & improves absorption capacity of intestines. It eaten in excessive it causes vomiting, nausea, diarrhea; in very high dose it is toxic to muscles by inhibiting the production of malic acid which can cause paralysis & death.

- ***Absorption & digestion of amino acid.***

When we eat high-protein foods, body breaks down protein into amino acids and peptides through digestive enzymes, such as pepsin & pancreas produces trypsin, chymotrypsin and other that aid in protein digestion.

Pepsin is the primary enzyme responsible for digesting protein; it acts on the protein molecules & breaks the bonds – called peptide bonds – that hold the protein molecules together. Next, these smaller chains of amino acids move in the stomach & then in small intestine where they're further broken down by enzymes released by the pancreas. Small intestine contains finger-like extensions called micro-villi. These structures enhance its ability to absorb dietary nutrients. Now the semi digested material pass through brush border and baso-lateral membranes of small intestine & di-tripeptides are absorbed by passive transport (facilitated or simple diffusion) or active transport (Na+ or H+ co-transporters) pathways. Di and tripeptides are more efficiently absorbed than free amino acids which in turns are better absorbed than oligopeptides. They're released into the bloodstream and used for various biochemical reactions.

Each amino acid has a different role in the human body. Upon absorption, some amino acids are incorporated into a new protein. Some fuel your muscles and support tissue repair. Others are used as a source of energy.

Tryptophan and tyrosine, for example, promote brain health. These amino acids support the production of neurotransmitters, leading to increased alertness and optimum nerve responses. Tryptophan also assists with serotonin production, lifting your mood and keeping depression at bay.

Phenylalanine serves as a precursor to melatonin, epinephrine, dopamine and other chemicals that regulate your mood and bodily functions. Methionine helps your body absorb selenium and zinc, two minerals that promote overall health. Some amino acids, such as isoleucine, play a vital role in hemoglobin production and glucose metabolism.

- ***Tryptophan: -***

It is an amino acids (protein) that is useful in bio-synthesis of protein; it is essential in human because body cannot make it); it is a precursor of neuro-transmitter serotonin, melatonin, vitamin B3; it is a sedative also.

Main sources of tryptophan: -

Salmon oil, egg, spinach, milk, seeds, fenugreek seed, soy products, nuts, fish, meat, wheat, banana etc.

Basic pharmacokinetics of tryptophan (based on human intake in natural food products): -

It is absorbed in small intestine & reached the blood circulation, it passes the blood brain barrier & in brain cells it is metabolized into indolamine neuro-transmitter, niacin, a common example of indolamine is serotonin derivative from tryptophan. Tryptophan is converted into serotonin in the brain & body; it is believed that tryptophan supplements should be taken with carbidopa, which blocks the blood brain barrier. (Serotonin (5HTP) 5 hydroxytryptamine, is a monoamine neuro-transmitter. It contributes in feelings of well-being, happiness, reward, learning, memory, many physiological functions).

In the pathway of tryptophan/serotonin, melatonin hormone is produced. Melatonin regulates sleep-wake cycle. It is primarily released by pineal gland in brain. It controls circadian (daily clock) rhythms. Pineal gland releases it at night more & very little in day light. It improves immune system function.

Natural sources of melatonin are tomato, pomegranate, olive, grapes, broccoli, cucumber, barley, seeds, nuts etc.

Fructose malabsorption causes improper absorption of tryptophan in intestine thus leading to low level of it & may cause depression.

Basic clinical pharmacology of tryptophan: -

It is necessary for normal growth of infants; nitrogen balance in adults, it aids in sleep pattern, mood. It is necessary for melatonin & serotonin formation in body, it enhances mental & emotional well-being, manages pain tolerance, weight etc. it also helps in build muscle tissue, essential for vitamin B3 production, relives insomnia, reduces anxiety, depression, migraine, OCD, helps immune system, reduces cardiac spasms, improves sleep patter etc.

- ***Threonine: -***

It is an amino acid used in biosynthesis of proteins; it is an essential amino acid important for tooth enamel, collagen, elastin, nervous system, fats metabolism, it prevents fats buildup in liver, useful in intestinal disorders, anxiety, and depression.

Main sources of threonine: -

Cheese, chicken, fish, meat, lentil, black seed, nuts, soy etc.

Basic clinical pharmacology of threonine: -

It is useful in nervous system disorders, multiple sclerosis, spinal spasticity, makes bones, joints, tendons, ligament stronger, it helps the immune system, promotes heart health.

- ***Isoleucine: -***

It is an amino acid that is used in the biosynthesis of proteins, it is an essential amino acid means the body cannot make it & we depend on food sources, it plays & helps many functions of the body.

Main sources of isoleucine: -

Meat, mutton, fish, cheese, egg, seeds, nuts, soybeans, milk, legumes, fenugreek seed etc.

Basic pharmacokinetics of isoleucine (based on human intake in natural food products): -

It is absorbed in small intestine by sodium-dependent active transport. It is metabolized in liver.

Basic clinical pharmacology of isoleucine: -

It promotes glucose consumption & uptake, it is anti-catabolic, enhances athletic performance & best for pre-workout, it acts on wound healing, detox of nitrogenous waste in the body, stimulates immune system, promotes secretion of many hormones, helps in heamoglobin formation, regulating blood glucose, energy in the body, built muscles, helpful to brain for its function.

- ***Leucine: -***

It is branched chain amino acid (BCAA) it is ketogenic amino acid; it is necessary when we do exercise, it stimulates protein synthesis & assists in muscle building.

Main sources of leucine: -

Cheese, soyabean, meat, nuts, chicken, seeds, fish, seafood, beans.

Basic clinical pharmacology of leucine: -

It helps regulate blood glucose, promotes growth, recovers the muscles & bone tissues, acts on production of growth hormones, repairs the tissues, essential for muscle building, it burns fats, controls obesity, promotes lean muscles growth.

- ***Lysine: -***

It is an essential amino acid, which our body cannot prepare and we need to eat it from food sources. It necessary for many body functions, acts in building blocks of protein (muscles).

Main sources of lysine: -

Red meat, chicken, egg, fish, beans, lentils, wheat germ, nuts, soybeans, spirulina, fenugreek seed, shrimp, pumpkin seed, tuna, cheese, milk etc.

Basic pharmacokinetics of lysine (based on human intake in natural food products): -

It is absorbed from the lumen of the small intestine into the enterocytes by active transport, it undergoes first pass metabolism in liver & is metabolized in liver.

Basic clinical pharmacology of lysine: -

It helps the body in tissue growth, repair muscles injury, promote collagen formation, help the body to produce enzymes, antibodies, hormones, supports immune system, its deficiency causes fatigue, irritability, nausea, hair loss, anorexia, inhibited growth, anemia, problems with reproductive system, it is very helpful in treating cold sores (herpes), control blood pressure, diabetes, osteoporosis, helps athletes performance, helpful in treating cancers, reduces anxiety, increase absorption of calcium, improves digestion & prevent leaky gut, helpful in pancreatitis.

- ***Methionine: -***

It is a sulfur containing amino acid; it is essential; it plays a critical role in the metabolism & health; it act on normal cell functioning, growth & repair. It is also a chelating agent for heavy metals; due to its sulfur contain it is helpful in hair, nail health & growth & good for skin health; it reduces cholesterol by increase the production of lecithin in liver & reduces fats formation in liver, also protects kidneys, liver from hepatotoxins, it is an antioxidant. It is absorbed in lumen of small intestines into enterocytes by active transport & metabolized in liver.

Main sources of methionine: -

Meat, mutton, fish, chicken, cheese, egg, beans, milk, nuts, shellfish etc.

- ***Cystine: -***

It is the oxidized dimer form of amino acid, it is nonessential; the body uses it to produce taurine & other amino acids; it is a sulfur containing amino acid; our body uses vitamin B6 with the help of cystine; it heals burns, wounds, bronchitis, assist in supply of insulin, it increases level of glutathione in liver, lungs, kidneys & bone marrow. It is anti aging, anti inflammatory, anti arthritis, anti rheumatoid arthritis.

Main sources of cystine: -

Meat, egg, milk, garlic, onion, broccoli, oats, wheat germ, lentils etc.

- ***Phenylalanine: -***

It is an aromatic essential amino acid in human; it plays a key role in biosynthesis of other amino acids; it is important in the structure & function of many proteins & enzymes. It is precursor of melanin, dopamine, noradrenalin hormone, thyroxin hormone. It is converted in tyrosine & used in biosynthesis of dopamine & noradrenalin. It improves memory, reduces pain of hunger; it is anti-depressant; it is also a building block protein; it is useful in vitiligo, depression, ADHA, parkinson's, multiple sclerosis, pain, osteoarthritis, rheumatoid arthritis, fat burn & helpful in alcohol withdrawal symptoms.

Main sources of phenylalanine: -

Pumpkin seed, nuts, seeds, soy, meat, fish, chicken, egg, beans, milk etc.

- ***Tyrosine: -***

It is a nonessential amino acid; it is also called as 4-hydroxyphenylalanine; it is useful in cell synthesis of protein; it is a building block protein; body prepares it from phenylalanine. It is a precursor & used to produce noradrenalin, dopamine, & thyroxin & melanin hormones. It reduces stress, improves memory, it promotes growth, mental health, skin health, fat burn. It acts as a mood elevator, anti-depressant, improves memory, mental alertness, its deficiency can cause hypothyroidism leading to low blood pressure, low body temperature (hypothermia), stress, fatigue, narcolepsy; it helps thyroid gland, adrenal gland, pituitary gland to function properly. It is absorbed in small intestine by sodium-dependent active transport; after absorption it reaches the blood & crosses the blood brain barrier (BBB) & enters the brain cells & gets metabolized into catecholamine (noradrenalin). Human body regulates it amount by eating it by food sources & making inside the body (nonessential). The body does not store it much for later uses.

Main sources of tyrosine: -

Meat, fish, egg, milk, nuts, beans, oats, wheat, black seeds etc.

Dopamine: -

It regulates reward & pleasure centers in brain; it is a chemical important for memory, motor skills & etc.

Nor-adrenaline & adrenaline: -

These hormones are responsible for fight & flight response in stressful situation & also controls many functions of the body; it is secreted by adrenal glands.

Thyroxin: -

It is secreted by thyroid gland; it regulates metabolism, blood pressure, digestion, energy etc.

Melanin: -

It is pigmented hormone, gives our skin, hair, eye their colour; dark skinned people have more melanin in their skin than light skin people (depend on exposure to sunlight).

- ***Valine: -***

It is an essential nutrient for vertebrates, biosynthesis of protein; it is an aliphatic & extremely hydrophobic essential amino acid; it is branched chain of amino acid (BCAA); it is important for growth, repair, blood glucose regulation, for energy; it stimulates CNS, proper mental function.

Main sources of valine: -

Cheese, soy, beans, nuts, fish, meat, chicken, mushroom, seeds, nuts, whole grains etc.

- ***Histidine: -***

It is an amino acid used in biosynthesis of protein; it is semi essential amino acid, needed by human for production of histamine & also for growth & tissue repair, it is helpful in maintaining myelin sheaths that covers the nerves & protects the nerves.

Main sources of histidine: -

Meat, mutton, fish, milk, egg, seeds, nuts, chicken, cheese, soy, beans, whole grains, fenugreek seeds.

Basic pharmacokinetics of histidine (based on human intake in natural food products): -

It is absorbed in small intestine via active transport requiring the presence of sodium.

Basic clinical pharmacology of histidine: -

It plays many roles in immunity, gastric secretion & sexual functions. It is also required for blood cell formation & protects tissues against damage of radiation & heavy metals. It keeps normal pH of 7 in the body, useful in rheumatoid arthritis, allergy, ulcer & anemia caused by kidney failure or dialysis. It is an antioxidant, anti inflammatory, reduces cholesterol.

- ***Arginine: -***

It is among conditional essential amino acid the body needs to function properly; it is made in liver; it plays an important role in building protein thus helpful in body building.

Main sources of arginine: -

Chicken, pumpkin seeds, spirulina, dairy products, red meat, fish, egg etc.

Basic pharmacokinetics of arginine(based on human intake in natural food products): -

It is absorbed in jejunum mainly from oral diet.

Basic clinical pharmacology of arginine: -

It releases nitric oxide in the blood & nitric oxide dilates the blood vessels thus increases the blood supply & controls high blood pressure, it improves erection, builds muscle etc. it also acts on release of growth hormone, insulin & other substances in the body. It also improves heart health, athlete performance, stimulates immune system; citrulline present in watermelon is converted into arginine in kidneys, please refer lesson on watermelon.

- ***Alanine: -***

It is a non-essential amino acid that is present in blood plasma in its free state in high levels; it is involved in sugar & acid metabolism, protein synthesis, it increases immunity, provides energy for muscles tissues, brain & CNS, it acts on tryptophan, vitamin B6 metabolism; it is an important sources of energy for muscles; it helps the body to convert simple sugar (glucose) into energy; it is produced in the body. It increases exercise capacity; reduces muscle fatigue, boost immunity, it is antioxidant; anti-aging; increases muscle growth; ideal pre & post workout, reduce blood sugar, prevent liver disease, helps the liver to eliminate toxins, improves CNS functioning, helpful in benign prostate hypertrophy. It is digested in small intestine; it is converted into pyruvic acid by alanine aminotransferase-1; during fasting condition alanine derived from protein breakdown is converted into pyruvate & used to synthesis glucose by gluconeogenesis in liver, it is excreted in urine via urea cycle. It is stored little in skeletal muscles.

Main sources of alanine: -

Meat, fish, egg, milk, aleovera, honey, black seeds, nuts etc.

- ***Aspartic acid: -***

It is a non-essential amino acid; it is over all negatively charged & plays an important role in synthesis of other amino acid, citric acid & urea cycles; it is found in animals, plants, sugarcane, sugarbeet. It may be a neurotransmitter; it strengthens the muscles, improves heart function, helps in maintaining mental health, reduces tiredness, improves athletic performance, increases muscle size, reduces depression & fatigue. It is absorbed in small intestine by active transport.

Main sources of aspartic acid: -

Meat, oysters, seeds, oats, avocado, sugar beet, milk, egg, nuts, cereals etc.

- ***Glutamic acid: -***

It is a nonessential amino acid. It is an excitatory neuro-transmitter; it is necessary for biosynthesis of proteins; body uses it for several key functions within the body like making other neuro-transmitters such as GABA; it promotes brain health, muscles health, intelligence, mood & mental alertness. It is called as chemical messenger. It plays an important role in body's disposal of excessive waste like nitrogen. It is absorbed in lumen of small intestine into enterocytes by active transport & excreted in urine mainly. It is almost about 2 kgs, storage in natural form in brain, kidneys, liver, muscles etc.

Main sources of glutamic acid: -

Meat, chicken, fish, egg, milk, wheat, mushroom, soy, broccoli, walnut, peas etc.

- ***Glycine: -***

It is a nonessential amino acid that body needs for growth &maintenance of tissue & need to prepare hormones & enzymes. It is inhibitory neurotransmitter. It helps in preparing glutathione (a powerful antioxidant & reduces free radicals, delay aging). It is helpful in preparing of creatine (provides energy to

muscles to perform exercise etc & acts on muscle contraction), beneficial for brain health, bone health, alzheimer's, schizophrenia, sleep disorder, stroke, burns, protects kidney & liver from harmful side effects of drugs used after organ transplant, heals wound & ulcers, it is anti inflammatory, improves skin health.

Main sources of glycine: -

Meat, fish, milk, legumes etc.

- ***Proline: -***

It is a protein-genic amino acid used in biosynthesis of proteins. It heals cartilages, cushion joints, tendons, ligament, heart muscles, connective tissues & helps in formation of collagen.

Main sources of proline: -

Soy, pumpkin seed, lentils, black beans, quinoa etc.

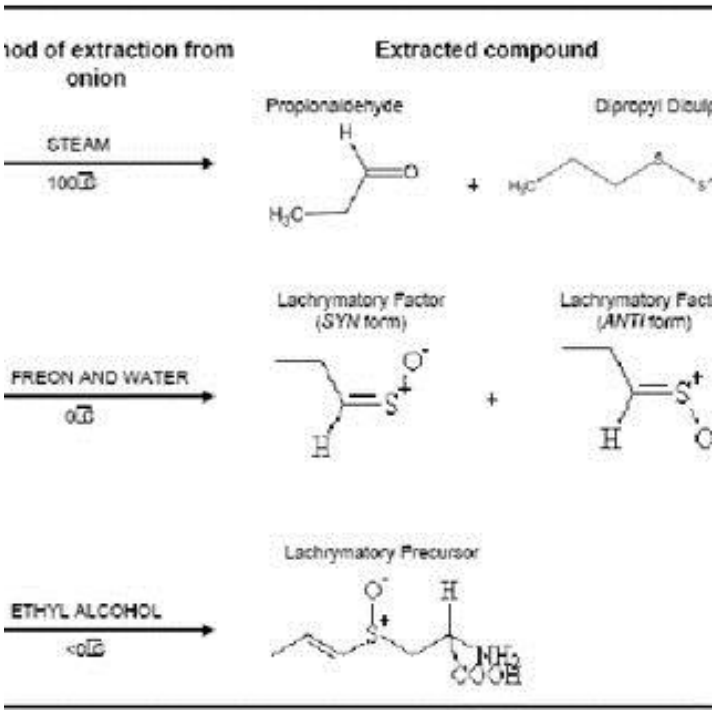
- ***Serine: -***

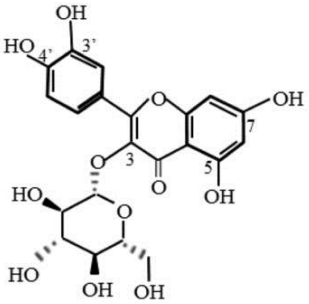
It is a nonessential amino acid, important for synthesis of protein, fats metabolism, muscle growth, immune system; it is a precursor of many amino acids, helpful in enzyme catalyze its reaction, overall health, physical & mental health.

Main sources of serine: -

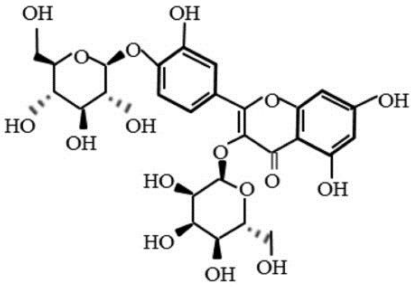
Soybean, egg, lentils, meat, fish, nuts, almonds, walnut etc.

- ***Main chemical structures of onion: -***

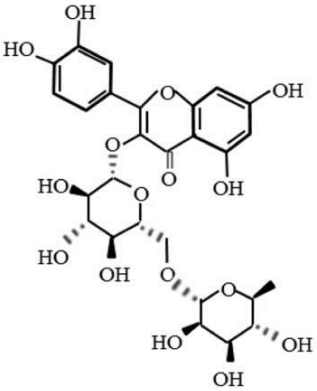




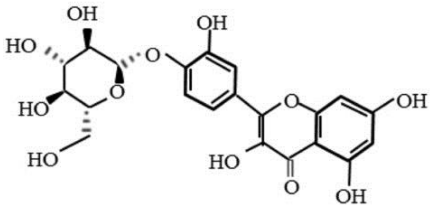
quercetin-3-glucoside



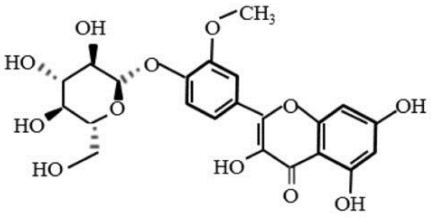
quercetin-3,4'-diglucoside



quercetin-3-rutinoside



quercetin-4'-glucoside



Isorhamnetin-4'-glucoside

ONIONS
FOR YOUR HEALTH

Onions add abundant flavor to a wide variety of food, yet are low in calories. With only 45 calories per serving, onions are naturally fat and cholesterol free. They are a source of dietary fiber, vitamin C, vitamin B6, potassium, and other key nutrients including folate, calcium and iron.

Bonus Benefits

Onions contain a variety of other naturally occurring chemicals known as organosulfur compounds linked to lowering blood pressure and cholesterol levels.

Among some of their best-known benefits, onions contain the flavonoid quercetin which acts as an anti-inflammatory in the body, inhibits low-density lipoprotein oxidation (an important reaction in the atherosclerosis and coronary heart disease), protects and regenerates vitamin E (a powerful antioxidant), and provides protection from many forms of cancer.

ONION NUTRITION FACTS

	Serving Size 1 medium onion (148g)	Percent Daily Values*
Calories	45	
Total Fat	0	0%
Cholesterol	0	0%
Sodium	5 mg	0%
Total Carbohydrate	11 g	4%
Dietary Fiber	3 g	11%
Sugars	9 g	–
Protein	1 g	–
Vitamin A	3 IU	0%
Vitamin C	11.8 mg	20%
Vitamin B6	0.2 mg	9%
Folate	28.5 mcg	7%
Calcium	34 mg	2%
Iron	0.31 mg	2%
Magnesium	15 mg	–
Phosphorus	43.5 mg	4%
Potassium	190 mg	4%
Zinc	0.3 mg	2%
Copper	0.1 mg	3%
Manganese	0.2 mcg	10%
Selenium	0.7 mcg	1%

*Percent (%) Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs.

Source: Food and Drug Administration (FDA)

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- ***Research: -***

Kaur tested the anti-obesity potential of quercetin isolated from *A. cepa* in combination to curcumin and piperine, from *Curcuma longa* L. and *Piper nigrum* L., respectively. Combinatorial preparation was realized by suspending curcumin: piperine: quercetin (94:1:5) in 5% Gum Acacia and 0.5% between 80 and it was administered per os at doses of 500, 1000 and 2000 mg/kg of body weight to high fat diet and low-dose streptozotocin-induced rats. After 28 days of treatment, plasma glucose level, triglyceride, LDL and cholesterol levels were significantly reduced (68.84%, 88.94%, 26.38% and 50.23%, respectively). Moreover, an improved glucose tolerance was observed.

Quercetin seems to play a potential role also in diet-induced thermogenesis, as it is also responsible for the browning effect of onion peel observed by Lee and co-workers, who reported that onion is able to modify the characteristics of white adipocytes to those of brown-like adipocytes in 3T3-L1 fibroblasts. The quercetin-associated browning effect seems to be mediated in part by the activation of AMP-activated protein kinase.

The inhibitory effects of sulphur-containing compounds found in fresh and/or cooked onion on the differentiation of white adipose cells has been recently reported. A strong inhibition of adipogenesis was demonstrated for cycloalliin, *S*-methyl-L-cysteine, *S*-propyl-L-cysteine sulfoxide, dimethyl trisulfide and *S*-methyl-L-cysteine sulfoxide. According to these results, the anti-obesity effect of the onion extract could be in part related to these compounds.

- ***Conclusion of research: -***

Onion is a plant with a long history of traditional medicinal uses. The extensive studies conducted in the last years confirmed that this species is a rich source of putative health-promoting phyto-chemicals,

including flavonoids and organo-sulfur compounds. A number of works deal with the potential beneficial effects of onion were known as pancreatic lipase inhibition, adipogenesis inhibition. Moreover, a substantial number of studies have proven the efficacy of onion in the treatment of pathological conditions linked to obesity, hyperlipidemia, diabetes, hypertension, cardiovascular diseases and inflammatory conditions.

Quercetin and organo-sulfur compounds seems to be the compounds responsible for the anti-obesity action; it has got following properties anti-inflammatory, antioxidant, anti bacterial, antiviral, antifungal, anticancer, anti-proliferative, carminative, digestive, healing, curative etc. It should be use of good quantity which is free from its fungal or other infection.