Vegetables, India's poisoned staple

India's traditional wisdom promoted vegetarianism which is now the preferred lifestyle option for those with a conscience. Ayurveda further fortified the practice of vegetarianism by creating and providing an extensive knowledge base for the produce and use of the entire spectrum of vegetation, from roots, bark, leaves, fruits and seed. It worked out the combinations, seasonal variants and culinary details. It even told you when to eat what and with what, for both taste and nutrition. Production processes were life supporting in all seasons, they supported the earth and all life on earth. The question to ask here is – how have the inheritors of the best food practices in the world, come to such a pass, that we are being poisoned by everything we produce and eat? *Consumer VOICE* presents you an account of how we have managed to do this to ourselves. Read our extensive in-depth study based on laboratory tests of pesticides in vegetables we are consuming on a daily basis…

Pesticides are used in vegetables and crops to protect them from damage and infestation from insects. However, if the amount of pesticides sprayed on the vegetables is more than the recommend amount, it affects soil, agriculture workers and consumers in one go.

The pesticides can leave adverse effects on the nervous system. Harmful pesticides can also cause several hazardous diseases like cancer, liver, kidney and lung damage. Pesticides can also cause loss of weight and appetite, irritability, insomnia, behavioural disorders and dermatological problem.

Banned Pesticides found in vegetables of daily consumption:

The following 4 banned pesticides were found in spinach and bitter gourd

- Chlordane in Bitter Gourd (KARELA)
- Endrin in Bitter Gourd (KARELA)
- Heptachor in Spinach (PALAK)
- Ethyl Parathion in Bitter Gourd (KARELA)

We tested vegetables samples for following banned pesticides:

- Aldrin
- Chlordane
- Endrin
- Heptachor
- Ethyl Parathion

List of the Vegetables Procured and Tested

Kundru, Cauliflower, Tomato, Broccoli (Green Gobhi), Brussels, Lady finger, Snake Gourd, Torai Dark Green, Bitter Gourd, Pumpkin, Bottle Gourd, Brinjal, A- Big & Round, B- Green, C- Small, Cucumber light green, Tinda, Gwar Fali, Kakri, Parval, Cabbage, Green Peas, Carrot, Potatoes, A- Haldwani, B- Pahadi, Spring onion, Onion Red variety, Radishes, Arbi, Zimikand, Chukandar, Chulai, A- Red, B- Green, Spinach, Poi, France beans, Lobia beans, Methi, Kamal Kakari, Ganth Gobhi

Test Program Background:

Pesticides are the common potent chemicals sprayed on the vegetables & other crops to escape damage from various insects and pests and to get higher yields from various agro produce. In tropical countries like India, possibilities of pests damages are maximum, due to hot & humid whether. Due to immense R&D carried out for preparation of pesticides manufactured from various chemical compounds, the crops and agro produce have been significantly saved from insect /pests damage. But due to poor awareness among growers, level and method adopted for using pesticides is unorganised, resulting in the health and safety risks for consumers and the environment, thus the objective of the study was to identify:

i) The range and number of pesticides used in vegetable fields.

ii) The level of presence of potent and toxic chemicals which were expected to be higher than the MRL (Maximum Residual Limits) level of pesticides.

iii) Identifications of banned pesticides sprayed which come from various illegal routes to the traders/retailers and the lack of knowledge of the cultivators.

Table: European Union (EU) violations at a glance

S. No.	Name of Vegetable	Name of Pesticides Found beyond EU Standards
1	Amaranth (Red) (Chaulai)	4-Bromo-2-chlorophenol, BHC alpha isomer
2	Bitter Gourd (Karela)	Acetamiprid, Captan, Methyl parathion
3	Bottle Gourd (Lauki)	Fipronil, Methyl parathion
4	Brinjal	Endosulfan sulfate
5	Ladyfinger (Bhindi)	Captan, Chlorpyrifos
6	Potato (Pahadi)	Methyl parathion
7	Pumpkin (Kaddu)	Methyl parathion
8	Snake Gourd (Chichinda)	Captan
9	Spinach (Palak)	Chlorpyrifos Methyl, Heptachlor, Parathion ethyl, Chlordane-cis, Endosulfan (alpha isomer), Chlordane-trans, Permethrin, Esfenvalerate, Fenvalerate
10	Tomato	Profenophos, Triazophos, 4-Bromo-2-chlorophenol, Methyl parathion

Table: Comparison of Indian and European Union (EU) Maximum Residue Limit (MRL) of some pesticides in vegetables

S.No.	Name of Pesticide	Indian MRL Unit- ppb (Times higher than EU limits)	EU MRL Unit- ppb
1	Malathion	3000 (150)	20 (Cauliflower)
2	DDT	3500 (70)	50 (Tomato)
3	Parathion methyl	1000 (50)	20 (Potato)
4	Endosulfan	2000 (40)	50 (Spinach)
5	Captan	15000 (750)	20 (Lady finger)

What is Maximum Residue Limit (MRL)?

Maximum Residue Limit or MRL for pesticides are established in most countries to safeguard consumer health and to promote Good Agricultural Practice (GAP) in the use of insecticides, fungicides, herbicides and other agricultural compounds. MRL is the maximum concentration of a substance, expressed in milligrams per kilogram (parts per million, ppm) or in micrograms per kilogram (parts per billion, ppb) that is legally permitted in a food commodity.

Violations as Per European Union (EU) Standards of Pesticides Found in the Tested Vegetables

Pesticide and Permitted MRL of EU in ppm	Tomato		Brinjal	Ladyfin-ger	Snake Gourd (Chichinda)	Pumpkin (Kaddu)	Bottle Gourd (Lauki)	Bitter Gourd (Karela)	Amaranth (Red) (Chaulai)	Potato (Pahadi)	Spinach (Palak)
	Hybrid	Desi									
Profenophos (0.05)	0.0551	0.1624	ND	ND	ND	ND	ND	ND	ND	ND	ND
Triazophos (0.01)	ND	0.0152	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetamiprid (0.01)	ND	ND	ND	ND	ND	ND	ND	0.0115	ND	ND	ND
Fipronil (0.005)	ND	ND	ND	ND	ND	ND	0.0157	ND	ND	ND	ND
4-Bromo-2-chlorophenol (0.01)	0.0144	0.0358	ND	ND	ND	ND	ND	ND	0.0255	ND	ND
Captan (0.02)	ND	ND	ND	0.0529 -0.2402	0.0348	ND	ND	0.0395-0.1564	ND	ND	ND
BHC alpha isomer (0.01)	ND	ND	ND	ND	ND	ND	ND	ND	0.0116	ND	ND
Methyl parathion (0.02)	ND	0.0206	ND	ND	ND	0.0501 -0.1257	0.0267-0.0956	0.0844-0.1915	ND	2.9425	ND
Chlorpyrifos Methyl (0.05)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.7248
Heptachlor (0.01)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1844
Chlorpyrifos (0.5)	ND	ND	ND	2.4711	ND	ND	ND	ND	ND	ND	ND
Parathion ethyl (0.05)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1797
Chlordane, cis- (0.01)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0743
Endosulfan (alpha isomer) (0.05)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0603
Chlordane, trans- (0.01)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0702
Endosulfan sulfate (0.05)	ND	ND	0.0837	ND	ND	ND	ND	ND	ND	ND	ND
Permethrin (0.05)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0663
Esfenvalerate (0.02)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1193
Fenvalerate (0.02)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1183

ND - Not Detected in Test

Maximum violations were of Methyl Parathion

- Pesticides were found beyond the EU MRL

To examine and assess the level of various pesticides present in the fresh vegetables sold across the country, *Consumer VOICE* conducted a test on pesticides used in fresh, seasonal vegetables.

The samples were purchased from 5 different areas of Delhi metro and some samples from other metro cities of India. In Delhi metro the retail markets as chosen were located close to the five wholesale *mandis* where fresh vegetables are transported in bulk to these *mandis*. The fresh vegetables are further transported to the retailers in the entire city for retail sale. To identify and quantify the presence of pesticides, a credible & independent accredited test lab was necessary to carry out this task. *Consumer VOICE* identified and approached an NABL accredited lab to utilise the state of art test facility where fresh vegetables would be tested for identification & quantification of various pesticides.

Objective of the Study:

1. Examine the total level of pesticides used in the individual vegetables as per MRL (Maximum Residual Limit) of permitted pesticides.
2. Identify the quantity of the level of pesticides used in the fresh vegetables.
3. Identify pesticides which are banned due to their potential toxicity impacts.
4. Spread awareness among consumers on presence of pesticides in fresh vegetables and their possible toxic effects.
5. To allay fear and anxiety prevailing in consumers' minds about safety of daily items of consumption.

Methods of sample procurement: Sample were procured from retail and wholesale markets, major residential areas of upper class, middle & lower income groups, posh localities residential areas etc.

List of Vegetables: *Consumer VOICE* and Arbro Analytical Division prepared list of vegetables currently being sold & consumed keeping in mind their variety also. Some of the vegetables were excluded that had high level of fibre contents, or are of a citrus nature as they cause interference in the estimation process of the instrument.

Samples were being tested at the Arbro Analytical Division

Test Lab:

Since testing was a very expensive task, *Consumer VOICE* joined hands with Arbro Analytical Division for conducting the analysis on a corporate social responsibility platform in this venture to extend the benefit to society. The testing Lab Arbro Analytical Division is accredited by NABL. The laboratory was suitably equipped with latest instruments and scientists to carry out the relevant tests. All the testing equipment/measuring instruments used for the testing have been periodically checked and calibrated and the records of such checks and calibration are available. The laboratory ensured that adequate quality control practices have been carried out during the tests and the laboratory can produce evidence of such quality control measures. The laboratory has preserved the raw test data and the laboratory maintained strict confidentiality and shall under no circumstances communicate the data to any one, not authorised by *VOICE* Society.

Test Method:

A validated test method was followed on quantification of pesticides & also non-permitted, if found. Besides, reference for MRL of EU has also been considered necessary for proposed revision of Indian requirement. Since

Name of Pesticides Tested

Sr. No.	Name of Pesticide	Sr. No.	Name of Pesticide	Sr. No.	Name of Pesticide
1	Acephate	36	Carbendazim	71	4-Bromo-2-chlorophenol
2	Diazinon	37	Thiophanate-methyl	72	Captan
3	Dichlorvos	38	Acetamiprid	73	Captafol
4	Dimethoate	39	Clothianidin	74	HCH alpha isomer
5	Ethion	40	Imidacloprid	75	HCH beta isomer
6	Iprobenphos	41	Thiacloprid	76	Lindane
7	Malathion	42	Thiamethoxam	77	Chlorothalonil
8	Methamidophos	43	Dimethomorph	78	Methyl parathion
9	Monocrotophos	44	Buprofezin	79	Chlorpyrifos Methyl
10	Omethoate	45	Cartap hydrochloride	80	Heptachlor
11	Phosalone	46	Emamectin Benzoate	81	Fenitrothion
12	Phosphamidon	47	Spinosad A	82	Aldrin
13	Profenophos	48	Spinosad D	83	Chlorpyrifos
14	Quinalphos	49	Abamectin	84	Parathion ethyl
15	Triazophos	50	Difenthiuron	85	Chlorfenvinphos
16	Atrazine	51	Azoxystrobin	86	Chlordane, cis-
17	Simazine	52	Flufenoxuron	87	DDE, o,p'-
18	Metalaxyl	53	Propargite	88	Endosulfan (alpha isomer)
19	Carbaryl	54	Fenpyroximate	89	Chlordane, trans-
20	Carbofuran	55	Fenamidone	90	DDE, p,p'-
21	Carbosulfan	56	Diflubenzuron	91	Oxyfluorfen
22	Indoxacarb	57	Trifloxystrobin	92	DDT, o,p'-
23	Methomyl	58	Pyraclostrobin	93	Endrin
24	Thiodicarb	59	Cymoxanil	94	Endosulfan (beta isomer)
25	Fenarimol	60	Famoxadone	95	DDD, o,p'-
26	Bitertanol	61	Etrimphos	96	DDD, p,p'-
27	Flusilazole	62	Ethofenprox	97	Endosulfan sulfate
28	Hexaconazole	63	Phorate	98	DDT, p,p'-
29	Myclobutanil	64	Oxydemeton-methyl	99	Dicofol
30	Penconazole	65	Fipronil	100	Cyhalothrin I (lambda)
31	Propiconazole	66	Metalaxyl-M	101	Permethrin
32	Tebuconazole	67	Iprovalicarb	102	Cyfluthrin
33	Triadimefon	68	Kresoxim methyl	103	Cypermethrin
34	Triadimenol	69	Tridemorph	104	Esfenvalerate
35	Difenoconazole	70	iprodione	105	Fenvalerate
				106	Deltamethrin

Pesticides are banned as per Indian Standards

identification and quantification requires very sophisticated instruments to carry-out such tests, test lab has utilised most relevant test methods and instruments for conducting various pesticides by following well recognised and accepted test methods.

Test Instruments

The lab to be utilised expected to use latest test instruments for identification & quantification as it to be most accurate and to meet the requirement of PFA minimum detection limits as prescribed pertaining to ppm/ppb level (The instrument used for analysis were for identification & Quantification LCMSMS, GCMSMS).

Tests Conducted:

The testing was conducted for all the pesticides as per PFA and EU requirements (MRL for each pesticide) as specified and cumulative quantity thereof for that product.

Harmful effects of pesticides:

1. ***Chlordane:*** Exposure to chlordane may be associated with testicular and prostate cancer. The non-cancer health effects of chlordane compounds (migraines, respiratory infections, diabetes, anxiety, depression, and activated immune system) may affect more people than cancer.
2. ***Endrin:*** Acute endrin poisoning in humans affects primarily the nervous system. Food contaminated with endrin caused several clusters of poisonings worldwide, especially affecting children, it is very toxic to aquatic organisms, namely fish.
3. ***Heptachor:*** The International Agency for Research on Cancer (IARC) have classified the compound as a possible human carcinogen. Animals exposed to Heptachlor during gestation and infancy are found to have changes in nervous system and immune function. It can cause loss of body weight and death.
4. ***Ethyl Parathion:*** It generally disrupts the nervous system. It is absorbed via skin, mucous membranes, and orally. Its exposure can result in headaches, convulsions, poor vision, vomiting, abdominal pain, severe diarrhea, unconsciousness, tremor, dyspnea, and finally lung-edema as well as respiratory arrest. It is known as "Schwiegermuttergift"(mother-in-law poison) in Germany.

The method used is confirmatory: it confirms the identity along with quantity

Legal Provisions:

Section 21 of the Food Safety and Standard Act, 2006 states that

(1) No article of food shall contain insecticides or pesticides residues, veterinary drugs residues, antibiotic residues, solvent residues, pharmacological active substances and micro-biological counts in excess of such tolerance limits as may be specified by regulations.

(2) No insecticide shall be used directly on article of food except fumigants registered and approved under the Insecticides Act, 1968.

Explanation – For the Purposes of this Section

"Pesticide residue" means any specified substance in food resulting from the use of a pesticide and includes any derivatives of a pesticide, such as conversion products, metabolites, reaction products and impurities considered to be of toxicological significance and also includes such residues coming into food from environment.

The Insecticides Act, 1968

An Act to regulate the import, manufactures, sale, transport, distribution and use of insecticides with a view to prevent risk to human beings or animals and for matters connected therewith. It extends to the whole of India.

Imprisonment & Fine:

- Section 50 of the Food Safety and Standard Act-2006 states that any person who sells to the purchaser's prejudice any food which is not in compliance with the provisions of this Act or the regulations made there under shall be liable to a penalty not exceeding five lakh rupees.
- Whoever uses an insecticide in contravention of any provisions of The Insecticides Act, 1968 or

any rule made there under shall be punishable with up to six months imprisonment and fine 500 - 5000 rupees.

Reasons of Pesticide Menace:

- Indiscriminate/injudicious use of chemical pesticide.
- Lack of awareness on the part of farmers with regard to judicious use of chemical pesticides.
- Non-observance of prescribed waiting periods, incorrect application techniques, more use than recommended dosages.
- Use of sub-standard pesticides.
- Wrong advice to farmers by pesticides dealers.

Remedies to Minimize its Impact on Human Health:

- Education to farmers about judicious use of chemical pesticides and adopting good agricultural practices & ill effects of indiscriminate use of chemical pesticides.
- Awareness about harmful effects of chemical pesticides, specially to farmers as they and their families will be exposed to it first.
- Re-evaluation and reduction of pesticide residue limits in food chain by Union Ministry of Health and Family Welfare.
- Increasing the punishment, besides fine, incorporate stringent provision of punishment to all offenders in the Food Safety and Standards Act, 2006 of food chain such as manufacturer/importer, dealer/retailer, farmer.
- Use of bio-pesticides to be encouraged. To encourage the use of bio-pesticides, farmers should be given assistance/subsidy by government.

Banned pesticides are in use by farmers because of following reasons:

- Laxity of government agencies to enforce ban of pesticides.
- Lack of knowledge of farmers or deliberate use for monetary gains as they know that government controls are not effective.

Areas/Regions of Delhi & other metros:

Consumer VOICE procured samples from various retail vegetable market places of Delhi,

Areas of purchase of sample were from retail/whole sale markets of Delhi & some from other cities.

Delhi Region:

1. Shalimar Bagh (proxy of Azad Pur Mandi) North Delhi
2. Bhogal Market (Closer to Okhla Mandi) South Delhi
3. Mayur Vihar (Closer to Gazipur Mandi)East Delhi
4. Keshopur (Keshopur Mandi) West Delhi
5. Daryagunj (Daryagunj Mandi) Central Delhi
6. A popular retail chain of fresh Fruits & Vegetables.
7. Selected market places from Kolkata
8. Selected market places from Bangalore

Total number samples procured.- 193 Nos.

Duration of sample purchase: weekly for 2 months period

Misuse of Novel Drug – Oxytocin

Oxytocin injection is widely being misued for getting more milk from cattle and for getting high yield of fruits and vegetables. Following recent media reports indicate that its misuse is on large scale:

- Lucknow, July11,2010: 16 arrested in FDA raids, 80,000 vials of oxytocin recovered in UP
- Jammu, July 16, 2010: Oxytocin injections worth ₹ 2 lakh seized
- Kanpur, July 20, 2010: Seizure of 13,000 oxytocin injections in UP
- Agra, August 14, 2010: Seizure of 25,000 oxytocin injections

The drug is cheap and readily available in local market. It has got many names such as 'paani', 'dawai', 'cocin'.

What is Oxytocin?

Originating from a Greek word meaning quick birth, Oxytocin is a mammalian hormone released by the posterior pituitary gland which induce labour and lactation in pregnant women. Vincent du Vigneaud, an American biochemist, received the 1955 Nobel Prize for Chemistry for his breakthrough achievement of synthesizing oxytocin hormone.

Oxytocin is a Prescription Drug:

To prevent misuse, Oxytocin Injection has been taken under the purview of Schedule 'H' (Prescription drugs) in the Drugs and Cosmetics Rules, 1945, so that no person/patient/milkman can purchase the drug without having requisite prescription from Registered

Pesticide Facts

According to World Health Organization estimates, pesticides cause 30,00,000 cases of poisoning and 2,20,000 deaths annually across the globe, the majority of which are reported from developing countries. These numbers, even more alarmingly, show a rising trend.

Source: WHO, 1990; DTE, 2001;Rosenstock, et al., 1991; Pimental, 1992; Kishi, et al., 1995; WRI, 1998)

The Indian pesticide industry with 85,000 MT of production during Financial Year 2007 is ranked second in Asia (behind China) and twelfth globally. In value terms, the size of the Indian pesticide industry was estimated at ₹ 74 billion for 2007. Globally the top five global MNCs control almost 78% of the market.

Source: Website: Bharat Book Bureau - Business Market Research Report Industry Analysis

As per Central Insecticide Board & Registration Committee (CIBRC), Faridabad (Haryana) there are 27 pesticides which are banned for manufacture, import and use in India.

Source: Website: Central Insecticide Board & Registration Committee

Medical Practitioner or Registered Veterinarian.

How Oxytocin is Misused:

Greedy milkman uses oxytocin injection by injecting it into the cow/buffalo in the mistaken notion that it produces extra milk. What it actually does is makes the milk flow faster by an increased blood flow to the mammary glands and the skin overlying these glands.

Lust for earning more money has tempted the fruit and vegetable growers by injecting oxytocin in to fruit and vegetables. First oxitocin is injected into plants and climbers which grow them more fast. In second phase the fruit and vegetable growers again inject oxytocin in to fruits and vegetables to enlarge their size in a short time. Oxytocin injection is mainly injected in bottle gourd, bitter gourd, pumpkin, spinach, watermelon, brinjal, cucumber, etc.

Harmful Effects of Oxytocin:

Oxytocin not only affects the cow and buffalo, it filters into milk, similarly it goes into injected fruits and vegetables. It has been held responsible for uterine cancers, male impotence, excessive hair and early or erratic periods on woman, balding for man and early development of breasts (for both sexes). It is considered harmful for the eyes, especially in children. The hormone affects the reproductive ability of woman. Its most common symptoms are exhaustion and loss of energy.

We Recommend:

Authorities should frame a definite policy regarding the manufacture, sale and use of oxytocin in food items.

We have talked to several roadside vegetable vendors; we are presenting one such conversation to you...

Meet: Vendor Shambhu

Shambhu is a doorstep vegetables vendor in New Delhi. He hails from Uttar Pradesh but is now the favourite vendor of most housewives in the Saket area. Summer or winter, he spreads his wares at the strategic cross section of roads leading to and from the temple cluster in the colony.

He comes early to catch the working women who like to shop for fruits and vegetables before starting the day, and by around noon, he manages to offload at least half his load. The rest he reaches to whosoever just tells him to bring the ordered stuffs to the house. He has a phone and has basic education, so is able to satisfy the finicky housewives who want it all in black and white and are not able to calculate fast. He shrugs off minimal cancellation in his bills, if it makes his customers happy. He brings specific fruits, vegetables and other food items on demand. He for example will bring you broccoli, mushrooms, avocados, baby corn, variety of coloured peppers and fresh paneer. He doles out advice on how to cook what to the younger lot of shoppers. He manages all the clamour and queries smilingly and if you have a heavy load, he offers to have it dropped to your home. He brings bananas for the colony's monkey visitors and will take time to answer all questions.

Meet: Kamla Aswani

Kamla Aswani comes all the way from Malviya Nagar (which has several vegetable shops) to shop at Shambhu's. She is sure only Shambhu can bring her the right mangoes at the right price for her annual pickling session. She like many others has a small family, hence shops for small quantities, which Shambhu happily accommodates. Shambhu also has an ongoing account system with several of his customers who either forget to carry money or do not have enough, and most times depends on the personal integrity of his customers for payback.

Vendor Shambhu with customer Kamla Aswani

Consumer Advice:

- Wash vegetables thoroughly under running drinking water to reduce water soluble pesticides.
- Discard outer leaves of leafy vegetables such as of cabbage.
- Peel when appropriate although some of the nutrients and fiber may be lost when vegetable is peeled.
- Steaming and cooking of vegetables eliminate most of the residues of pesticides.
- Switch to organic vegetables to reduce exposure to chemical pesticides.

Know your veggies

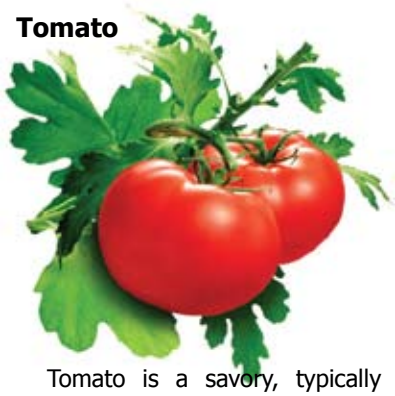
Carrot

Benefits

There are two varieties of carrots available in the Indian mandis- red and orange. *Consumer VOICE* tested the orange one.

1. Carrots contain large quantities of vitamin A, in the form of beta carotene.
2. Carrot juice has anti-carcinogen properties. Thus, it helps prevent cancer.
3. Carrots are also good for skin.

Tomato



Tomato is a savory, typically red, edible vegetable as well as the plant (Solanum lycopersicum) which bears it.

Varieties of Tomatoes Widely Available Include:

Beef Tomatoes, Vine Ripened Tomatoes, Cherry Tomatoes, Sungold Tomatoes, Baby Plum Tomatoes, Midi Plum Tomatoes, Plum tomatoes.

Health Benefits of Tomato:

1. A large consumption of tomato can help improve skin texture and colour.
2. Tomato is a good blood purifier.
3. Tomato helps in cases of congestion of the liver (protects the liver from cirrhosis) as well as for dissolving gallstones.
4. Tomato is a natural antiseptic therefore it can help protect against infection. Nicotinic acid in tomatoes can help to reduce blood cholesterol, thus helps prevent heart diseases.
5. Vitamin K in tomatoes helps to prevent hemorrhages.

6. Tomato contains lycopene, this pigment is a powerful antioxidant that can also fight cancer cells.

Cauliflower

Cauliflower is one of the cruciferous vegetables, it has a compact head usually that is composed of undeveloped flowed buds. Cauliflower lacks the green chlorophyll found in other members of the cruciferous family of vegetables. Cauliflower is nutritious, and may be eaten cooked, raw or pickled.

Health Benefits of Cauliflower:

- Cauliflower contains phytochemical which may stimulate enzymes that block cancer growth and is a good blood and liver detoxifier.
- Cauliflower contains indole-3-carbinol, a substance that can affect the metabolism of estrogen in the body and can prevent breast and ovarian cancer.

Caution: Cauliflower contains goitrogens, natural substances in certain foods that can interfere with the function of thyroid gland. Individuals with existing and untreated thyroid problems may want to avoid cauliflower for this reason.

Broccoli

Broccoli is classified in the Italicacultivar group of the species Brassica oleracea. Broccoli has large flower heads, usually green in colour, arranged in a tree-like fashion on branches sprouting from a thick, edible stalk.

Health benefits

Broccoli provides a high amount of vitamin C, which aids iron absorption in the body, prevents the development of cataracts and also eases the symptoms of common cold.

- The folic acid in broccoli helps women sustain normal tissue growth and is often used as a supplement when taking birth control pills and during pregnancies.
- The potassium in broccoli aids those battling high blood pressure., while a large amount of calcium helps combat osteoporosis.
- Broccoli has indole-3-carbinol which helps prevent hormone-related cancers, such as breast and prostate cancer.
- It is also effective in preventing alzheimer, diabetes, calcium deficiencies, stomach and colon cancer, malignant tumors, lung cancer, heart disease, arthritis, and even the aging process.
- A compound found in broccoli and broccoli sprouts appears to be more effective than modern antibiotics against the bacteria which causes peptic ulcers.

Spinach

Spinach (Spinacia oleracea) is an edible flowering plant. It is one of the top 10 healthy vegetables that you can eat but to enjoy its maximum nutritional value, it should be consumed fresh (juice), steamed or quickly boiled.

Health benefits:

- Apart from being a rich source of many vitamins like A, B, C, E and K, spinach is also rich in many essential minerals like manganese, magnesium, iron, calcium and potassium.
- Spinach is an extremely powerful antioxidant. It contains beta-carotene that helps in destroying the free radicals in the body and thus prevents cancer.
- The anti-inflammatory properties of spinach juice have the ability to reduce pain. The alkalinity of spinach juice dissolves the deposits around the joints to reduce pain and swelling.

Bitter gourd

Bitter gourd has excellent medicinal virtues. It is antidotal, antipyretic tonic, appetizing, stomachic, antibilious and laxative. It is also used in native medicines of Asia and Africa.

Health benefits

- Bitter gourd juices help in purifying blood and treatment of scabies, psoriasis, ringworm infection, and other fungal infections.
- It also helps to alleviate itching sensations.

- Bitter gourd plant also helps in the treatment of respiratory diseases. It is used in the treatment of asthma, bronchitis, pharyngitis and rhinitis.
- The juice of bitter gourd leaves also helps to prevent damage of the liver due to alcoholism.
- The juice of the bitter gourd leaves is also used in the treatment of cholera. The ripe fruit of Bitter gourd has been suggested to be useful in the treatment of cancer and diabetes.

Cabbage

Cabbages are members of the cruciferous family seem to be rich in anti-oxidants and are in the first line of defense against cancer. There are three major varieties of cabbage – green, red and savoy.

Health Benefits

- **Anemia:** The super healing effect of the superior chlorophyll in cabbage has been found to be good for blood building.
- **Cancer:** Daily and frequent consumption of cabbage juice has shown to be effective in preventing and treating cancers of breast, colon, liver, lung and ovarian.
- **Digestive system:** The amino acid glutamine in cabbage juice is totally gentle and cleansing on the digestive system, detoxifying, repairing ulcers, healing and regenerating.
- **Immune systems:** A compound called histidine in cabbage is found to be useful in treating allergies and regulating the T-cells in our immune systems.
- **Weight loss:** A substance in cabbage inhibits the conversion of sugar and other carbohydrates into fat, definitely a painless way of dieting.

Potatoes

Potato is a starchy, tuberous crop from the perennial Solanum tuberosum of the Solanaceae family.

Health benefits

- **Weight Gain:** Potatoes are mounds of carbohydrates and contain proteins too. This makes it an ideal diet for those lean and thins who desperately want to put on weight.
- **Digestion:** Since potatoes predominantly contain carbohydrates, they facilitate digestion.
- **Skin Care:** Vitamin-C and B-complex and minerals like potassium, magnesium, phosphorus and zinc are good for skin.
- **Scurvy:** Vitamin-C present in potatoes can help prevent this dreaded deficiency disease, caused due to lack of vitamin-C.
- **Brain Function:** Proper functioning of the brain depends largely on the glucose level, oxygen supply, some members of the vitamin-B complex and some hormones, amino acids and fatty acids like omega-3 fatty acids.
- Heart Diseases: Apart from the vitamins (B-complex, C), minerals and roughage, potatoes also contain certain substances called Carotenoids which are beneficial for heart and other internal organs.

Brinjal

It is one of the most common vegetables grown throughout the country. This can be grown successfully under the climatic conditions prevailing in South. It comes up well even in hilly regions where the temperature does not come down below 5 C.

Health Benefits

- Brinjal effectively treats enlarged spleen caused due to malaria.
- Eating brinjal is an effective way of maintaining blood cholesterol levels.
- Taking soup made of mashed brinjal and tomato (add pepper and salt to it) helps in digestion and increases appetite.
- Brinjal effectively treats gas, congestion and phlegm.
- It also cures insomnia.
- Taking a mashed form of brinjal or soup adding asafoetida and garlic in it helps get rid of flatulence.