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Review Article

### Review on Bioactive and Antioxidant Potential of Coloured Fruits and Vegetables

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#### ABSTRACT

The colour of fruits and vegetables represent a lot about their nutritional value. These nutritional values are due to presence of bioactive substances like vitamins, minerals, antioxidants and phytochemicals. Among natural dietary supplements, fruits and vegetables, in spite of low in calorific value, play very important role in human diet as a major source of biologically active compounds. Now a days, fruits and vegetables are gaining popularity and new ways of using as nutraceutical, antioxidants and medicines for treating diabetes, atherosclerosis, mastitis, cancer, Alzheimer's disease, foot and mouth disease, gastric disorders, night blindness, skin allergies, hypersensitivity reaction, food poisoning, retention of placenta etc. The medicinal benefits are suitable for both the human as well as animals, being cost economic without side effect. The North Eastern Terai region of Uttar Pradesh harbors green lush vegetation having coloured fruits and vegetables. Till date 25 fruits and 21 vegetables plants are reported, which have enormous biological power and potential of nutraceutically active biomolecules. Therefore, the present study has undertaken to ascertain the possibilities of nutraceutical potential of coloured fruits and vegetables.

**Keywords;** Nutraceuticals, Antioxidants, Phytochemicals, Bioactive molecule.

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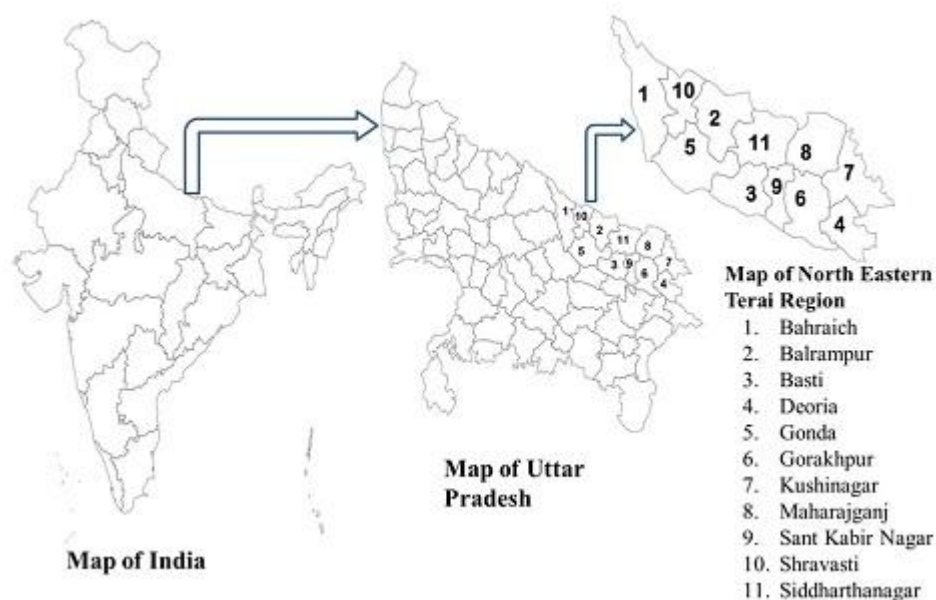
#### Introduction

North Eastern Terai region of UP, India is blessed with vast variety of lush green vegetation including different fruits and vegetables. These important fruit and vegetable plants are either grown naturally or cultivated in all the district of North Eastern Terai region of U.P. and eaten by local people but rarely do they know about their valuable knowledge and uses. The current work is an attempt made to document the present knowledge available in the local society of North Eastern Terai region of U.P. about fruits and vegetables. Research over past decade revealed vast array of health benefit arising from consumption of fruits and vegetables. Many researchers have focused on property of flavonoids, large class of phenolic compounds, carotenoids, anthocyanins, polyphenolics and vitamins that is abundant in such food<sup>1</sup>. Such compounds play disease prevention/ reduce disease risk factors through antioxidant activity<sup>2</sup>. Nutraceutical rich vegetables have medical health benefits including the prevention and treatment of diseases<sup>3</sup>. The colours of fruits and vegetables speak the volume of their nutritional value. This review will increase awareness about

fruits and vegetables among all those people who are away from knowing nutritional and medicinal benefit of these plants.

#### Study area and people

Study of coloured fruits and vegetables was conducted in 11 district of North Eastern Terai Region of Uttar Pradesh namely Bahraich, Balrampur, Basti, Deoria, Gonda, Gorakhpur, Kushinagar, Maharajganj, Sant Kabir Nagar, Shravasti and Siddharth Nagar. The area of investigation lies in 26° 34' to 26° 23'N latitude and 81° 38' to 84° 24'E longitude and at an elevation of 86m (282.08 ft) (fig.1). It is bounded by neighboring country Nepal in the north and Bihar state of India in the east. The landscape comprises a mosaic of human habitations, agricultural fields, grasslands, commercial plantations and forests having lush of crop cultivation including fruits and vegetables, predominantly fruits and vegetables cultivated by selected farmers which livelihood depend on it. Basically there is no knowledge of eating benefit of vivid coloured fruits and vegetables among most of the local as well as in urban peoples.



**Figure1:** Location Map Showing Districts of North Eastern Terai Region of Uttar Pradesh

## Results and Discussions

Local people are renowned for their dependency on plants for their economic and nutritional needs. Due to continuous changing life style, people do not pay attention to use nutritional food. Hence, there is a chance that this valuable practical documentation of listed fruits and vegetables will reveal the information with scientific name, family, bioactive compounds, nutraceutical benefits and references. A total of 46 fruits and vegetables plants are listed in (table-1 and 2) of which about 29 plants are having abundant nutraceutical

benefits. Table-3 shows vegetables of different modification like leafy, stem, flower, roots, bulb and tuber while fruits only ovary of flower. The vegetables of different modification shows different nutritive value basically it is characterized due to presence of vitamins and minerals, some leafy and flower vegetables having dietary fiber while root, bulb and tuber stored complex carbohydrate and dietary fiber. Table 4 as well as Figure-2 shows some bioactive compounds or phytochemicals derived from different fruits and vegetables used as nutraceuticals.

**Table-1: Fruits, common names, family, bioactive compounds and their Nutraceutical benefits**

S. N.	Common name	Scientific name	Family name	Bioactive compounds	Nutraceutical benefits	Ref
1.	Mulberry, Shahtoot	<i>Morus alba</i> L.	Moraceae	Moroles B-F, kaempferol glucuronide, galloctechin, quercetin, gallic acid	Fruits have pharmacological properties such as antioxidants, anti-diabetic, anti-atherosclerotic, anti-obesity and hepatoprotective activity.	Chan, E. W. C et al, (2016) <sup>4</sup>
2.	Paniyala, Indian Coffee Plum	<i>Flacaurtia jangomas</i> (Lour.)	<u>Salicaceae</u>	Phenolic acid, Ascorbic acid, Linoleic acid, Oleic acid, Stearic acid, Tannins and Tartaric acid	Antioxidant activity, Anti-inflammatory, Works against aging and neurodegenerative diseases like Alzheimer.	Dubey, N., & Pandey, V. N. (2013) <sup>5</sup>
3.	Watermelon	<i>Citrullus vulgaris</i>	Cucurbitaceae	Phenolics, Tannins, Flavonoids	Balances ionic concentration, health benefits. and antioxidant properties	Hannah M.A.C et al (2015) <sup>6</sup>
4.	Lychee	<i>Litchi chinensis</i>	Sapindaceae	Epicatchin, procyanidin A2 and B2, glycoside and saponin	Rich antioxidant activities with Ascorbic Acid,	Queiroz, E. D. R. et al, (2015) <sup>7</sup>
5.	Pine apple	<i>Ananas comosus</i>	Bromiliaceae	Bromelin	Styptic, Emmengogue, Anthelmintic, Vermicide, diaphoretic, Aperient, Unripe fruits improve digestion and can be used for dyspepsia, uterine tonic help in faster wound healing. It also have anti-diabetic, antioxidants and hyper lipendmic Properties	Khan et al, (2011) <sup>8</sup>
6.	Common Plum	<i>Prunus domestica</i>	Rosaceae	Amygdaline, emulsin and little of malic acid	Coolant, Laxative, Emollient, Antioxidant properties are higher compared to dry fruits. Juice has anti-cancer properties by including apoptotic change especially in colon cancer in human. Keeps hyper lipedemia in check so useful to prevent atherosclerosis. They are good source of Selenium ion and Boron hence preserve bone density.	Halloran et al, (2010) <sup>9</sup> Shivhare et al, (2011) <sup>10</sup>

7.	Lime, Lemon	<i>Citrus limonum</i>	Rutaceae	Geraniol, 1-linalool, Citral and Hesperidin Glucoside	Refrigerant, Pithasamani, Antiscorbutic, Rind of fruit-stomachic, Carminative, Rich source of vitamin-c thus increase resistance against cold/fever. As antiseptic and can be used in cuts, bruises and infections. Juice good for asthma, headache, pneumonia, and arthritis. Blood and body purifier and mild diuretic.	Bertuzzi et al, (2013) <sup>11</sup>
8.	Narangi, Orange, Santara	<i>Citrus reticulata</i>	Rutaceae	1-Limonene, r-Terpinene, and $\beta$ -phellandrene, Tannins, Flavonoids and Phenolic derivatives	The fruit is laxative, aphrodisiac, astringent, tonic, relieves vomiting	Apraj, V. D., & Pandita, N. S. (2014) <sup>12</sup>
9.	Pomegranate	<i>Punica granatum</i>	Punicaceae	Protein, Minerals like Ca, Mg, P, Fe, Na, Cu, S, Cl and Vitamins like carotene, Thiamine, Riboflavine, Nicotinic acid, Vit-C, Pectin, Fruit rind has Unsolic acid.	Coolant, can suppress estrogen thus helpful in breast cancer. Slow the development of Alzheimer's disease. Its juice helpful in diarrhea, cure stomach ailments dysentery, Anti-inflammatory, prevent morning sickness, Nausea, Antioxidant and reduce blood pressure. Prevent bacteria from sticking to the epithelial lining of the stomach. fiber content maintains the bowels movements and help in hemorrhoids and constipation during pregnancy.	Jurenka (2008) <sup>13</sup>
10.	Mango	<i>Mangifera indica</i> L.	Anacardiaceae	Gallic acid	Laxative, diuretic, tonic, anthelmintic, Rich in Fe thus helpful in anemia. The esters, terpenes and aldehydes present in the mangoes, increase appetite and also improve digestion. High content of vitamin B6, help in maintaining and improving brain functions. The Beta-carotene present helps in enhancing the immune system of the body and makes it strong.	Wauthoz et al, (2007) <sup>14</sup>
11.	Jamun, Jambul	<i>Eugenia jambolana</i>	Myrtaceae	Jamboline, a pale yellow essential oil, ellagic acid	Stomachic, Diuretic, Hepatoprotective, tonic, Haematinic and semen promoter	Pepato, M. T et al, (2005) <sup>15</sup>
12.	Papaya tree or Papaw	<i>Carica papaya</i>	Caricaceae	Papain or Papayotin, Papayic acid, Carpaine and carposide	Laxative, diuretic, anthelmintic, emmenagogue, alterative, antibacterial, antiviral, anti-inflammatory and antipyretic. Fibrinolytic helps in dissolving the blood clots. Aids digestion contain high Manganese content which is good for preventing osteoporosis and bone fractures.	Prabhu, A. K. et al (2017) <sup>16</sup>
13.	Indian gooseberry, Embelic myrobalan	<i>Phyllanthus embelica</i>	Euphorbiaceae	Essential oil, emblic acid, Phyllanthin	Refrigerant, Laxative, diuretic, Nutritive tonic as it is rich in vitamin-c, it is used for treatment of scurvy, possess antiviral (HIV, HERPES VIRUS, CMV) antimutagenic, antiallergic and anti-bacterial properties.	Dhale and Mogle (2011) <sup>17</sup> Debmandal and Manda (2011),
14.	Custard apple, sugar apple	<i>Annona squamosa</i>	Annonaceae	Acrid	Coolant, tonic, Haematinic, Seeds have anti-tumour effects. It helps in wound healing. It enhances immunity, helpful in prevention of cancer, It have potent antibacterial property. Curbs appetite, reduce fats absorption, Prevent strokes, Seeds used in managing enlarged prostate glands in man and for control of intestinal worms.	Pandey and Barve (2011) <sup>18</sup> Chen et al, (2012)
15.	Guava	<i>Psidium guava</i>	Myrtaceae	Eugenol, Essential oil and mineral	Laxative, anti-bacterial activity against diarrhea causing organisms like <i>Staphylococcus</i> , <i>Shigella</i> , <i>Salmonella</i> , <i>Bacillus</i> , <i>E. coli</i> , <i>Clostridium</i> and <i>Pseudomonas</i> .	Gutierrez et al, (2008) <sup>19</sup> Kamath et al, (2008) Rai et al, (2009)
16.	Sour orange, Bitter orange	<i>Citrus aurantium</i>	Rutaceae	d-linalool, Hesperidin Glucoside,	Refrigerant, stomachic, tonic, blood purifier, rich in vitamin-c and beta-carotene, thus anticancer property. Helpful in asthma attacks, bronchitis, atherosclerosis, gum disease, boost fertility and healthy sperm.	Haaz et al, (2006) <sup>20</sup> Peixoto et al, (2012)
17.	Indian Date, Jujube	<i>Ziziphus mauritiana</i> Lam.	Rhamnaceae	Rich in vitamin A, flavonoids, epicatechin, rutinoids.	The fruits are a good source of vitamin C and sugars, and contain appreciable amounts of mineral constituents. Fruit is considered to purify blood and aid digestion. They are also cooling aphrodisiac, anodyne, tonic, sedative, anticancer and potent wound healer, laxative, and invigorating. The preparation JOSHANDA	Rathore, S. K. et al, (2012) <sup>21</sup>

					made from ber is used in chest complaints.	
18.	Banana	<i>Musa paradisiac L.</i>	Scitamineaceae	Vitamin-A, Tannin and minerals like Ca, Mg, Fe, S, P and Cu.	Demulcent, Laxative, nutritive, emollient, Astringent, help in antidiarrheal dysentery and intestinal lesions smoothens the stomach. Good for dyspepsia, Strengthens the mucosa of stomach against acid and ulcers.	Imam and Akter (2011) <sup>22</sup>
19.	Makoi/ Blacknight shade	<i>Solanum nigrum Linn.</i>	Solanaceae	Rich in phenol, flavonoids, saponins and caumarine	It is anti-inflammatory, anti-convulsant activity, treat tuberculosis and diabetes, epilepsy, cardiovascular disease, cancer, colonic adenoma and Alzheimer disease (Gupt et al, 2006)	Ravi V. et al (2009) <sup>23</sup>
20.	Stone apple/Bael	<i>Aegle marmelos</i>	Rutaceae	Mucilage, pectin, sugar, flavonoids, phenolics and phenolic diterpenes, tannin (tannic acid), volatile oil and Bitter principle	Astringent, Laxative, Stomachic, free radical catalyzed prevent oxidative reactions	Rajan, S. et al (2011) <sup>24</sup>
21.	Khajoor / date palm	<i>Phoenix dactylifera L.</i>	Arecaceae	Rich in antioxidants, riboflavin, biotins and thiamin, iron, calcium, copper, cobalt, manganese, phosphorus.	Antioxidant activity in the body, adding nutrient, growth and development of body.	Baliga, M. S., et al (2011) <sup>25</sup> Biglari, F et al (2008) <sup>26</sup>
22.	Cluster fig tree/ Goolar fig	<i>Ficus racemosa (syn. F. glomerata Roxb.)</i>	Moraceae		Properties like astringent, promote callus, healing in fracture, alleviates Raktipitta, against burning sensation and obesity, decoction of fruit used in miscarriage and hemorrhage.	Joseph, B., & Raj, S. J. (2010) <sup>27</sup>
23.	Cadamba,	<i>Anthocephalus cadamba (Roxb.) Miq.</i>	Rubiaceae	Alkaloids, tannins, saponin, glycoside, steroids	Wound healing, antioxidant, antimalarial and heatprotective activity. Used as herbal medicine in ancient scientific tradition.	Gautam, Rakhi (2012) <sup>28</sup> Gautam Palshikar et al, (2013) <sup>29</sup>
24.	Monkey fruit, barhal	<i>Artocarpus laucha Buch.-Ham.</i>	Moraceae	Rich in phenolic compounds, Cycloartenone, α-amyryn and lupeol acetate. (Pavanasasinam and Sultanbawa,1973)	Especially used for treatment against inflammation, malarial fever and diarrhea, diabetes and tapeworm infection. It has also antifungal, antiplatelet and antiarthritic activity.	Pandey, A., & Bhatnagar, S. P. (2009) <sup>30</sup>
25.	Jackfruit, kathal	<i>Artocarpus heterophyllus Lam.</i>	Moraceae	Rich in carotenoids and flavonoids, volatile acid sterols, artocarpine, artonins.	Used in Ayurvedic and Unani system of medicines, as nutrition, used as vegetables and pickles, seed extract, used in diarrhea and dysentery.	Baliga, M et al. (2011) <sup>31</sup>

Table-2: Vegetables, common names, family, bioactive compounds and their nutraceutical benefits

S. N.	Vegetables	Scientific Name	Family Name	Bioactive compounds	Nutraceutical benefits	Ref
1	Coconut	<i>Cocos nucifera L.</i>	Arecaceae	Phytoharmones, Peroxidas, RNA, Polymerases	Coconut juice has estrogenic effect, It have both antibacterial and antiviral properties, antidote effect, antioxidant effect and antithrombotic effect.	Esquenazi et al., (2002) <sup>32</sup>
2	Beet	<i>Beta vulgaris L.</i>	Amaranthaceae	Betacyanin, betalains, vulgaxanthin-I and II.	Beneficial effect in tuberculosis, constipation, poor appetite obesity, gout pimples and tumors hepatic disorder.	Sacan and Yanardag (2010) <sup>33</sup> Tytti Kujala et al (2001).
3	Ladies Finger/ Bhindi	<i>Abelmoschus esculentus L.</i>	Malvaceae	Mucilage	Have blood sugar stabilizing property by regulating sugar absorption from intestine. Have anti-ulcer property. Have Hypoglycemic effect. Lower cholesterol in blood prevent cancer as it bind to bile acid.	Sabitha et al, (2011) <sup>34</sup> Kahlon et al., (2007) <sup>35</sup>
4	Tamarind/ Haldi	<i>Tamarindus indica L.</i>	Fabaceae	Cardiac glycosides, Tartaric acid, reducing	Have anti-microbial effect, anti-inflammatory properties, Hypolipomic	Iftexhar, (2006) <sup>36</sup>

				sugars and P, K, Ca, Mg.	and antioxidants activities.	De Caluwe et al (2010) <sup>37</sup>
5	Egg plant/Brinjal / Baingan	<i>Solanum melongena</i> L.	Solanaceae	Rich source of Fe, Ca, P, and Vitamin-B complex, anthocyanin, phenol, glycoalkaloids (Solasodine)	Antithaemorrhoidal and hypotensive effect, lower blood Cholesterol level. It has many pharmacological activities.	Guimaraes et al, (2000) <sup>38</sup> Tiwari, A. et al (2009) <sup>39</sup>
6	Drum Stick/ Sahjan	<i>Moringa oleifera</i> L.	Moringaceae	Particularly rich in K, Ca, P, Fe, Vit. A, D, glucosinolates and isothiocyanates.	Can be used for treatment of diabetes, Hypertension, HIV/AIDS, and is hypotensive, antispasmodic, antiulcer and anti-inflammatory.	Fahey, J. W. (2005) <sup>40</sup>
7	Cabbage	<i>Brassica oleracea</i> L. var. capitata	Brassicaceae	Beta carotene	Have anti-cancer, antioxidant, anti-inflammatory, antibacterial antiasthmatic and analgesic properties. It improves digestion, circulation and constipation.	Sun, Chang-Hao et al (2012) <sup>41</sup>
8	Broccoli	<i>Brassica oleracea</i>	Brassicaceae	Quercetin, Sulphoraphane, Polyphenol, Glucosinolates	Potent antioxidant and anticancer activity. Reduce cholesterol, rich Chromium that regulate insulin.	Mahn and Reyes (2012) <sup>42</sup> , Koh E et al, (2009) <sup>43</sup> Thangam et al, (2013)
9	Carrot	<i>Daucus carota</i> L.	Apiaceae	Acid oligosaccharide, Anthocyanins, Chlorogenic acid, caffeic acid, carotenoids, phylloquinone, tocopherol.	Major anti-oxidant activity in yellow colour carrot than purple orange, Potent anticancer, artery-protecting, immune modulating infection fighting antioxidant properties. Promote reproductive potential, relief constipation and decrease cholesterol.	Koley et al, (2014) <sup>44</sup> Sun, T et al, (2009) <sup>45</sup> Xiao et al, (2012) <sup>46</sup>
10	Cucumber, kakadi, khira	<i>Cucumis sativus</i> L.	Cucubitaceae	$\beta$ -carotene	Pro-vitamin A (A precursor of retinol), Prevalent from Phrynoderma, anaemia (Mares-Perlman et al. 2002) Have cooling effect, help full in fever, acidosis, constipation high blood pressure, Rheumatism, Obesity.	Cuevas et al, (2010) <sup>47</sup> Shohag et al, (2012) <sup>48</sup>
11	Radish	<i>Raphanus sativus</i> L.	Brassicaceae	Raphanin, Methyl mercaptan.	Antiviral, anti-microbial, secretolytic property. Helpful in uterine involution, Bronchitis, hyperlipidemia, urinary complaints, piles, gastro dynamic pain (Harborne and Baxter, 1995)	Harborne et al, (1995) <sup>49</sup> Ghayur and Gilani (2005) <sup>50</sup>
12	Chilli, Mirch	<i>Capsicum annum</i> L.	Solanaceae	Capsaicinoids, flavonoids, Phenols, Capsanthin, Capsorubin, Lignan	Digestive, carminative, Stimulants, cardiogenic, antipyretic, expectorant, antioxidant and anti-inflammatory property., help in uterine involution	Chengaiyah et al. (2008) <sup>51</sup>
13	Tomato	<i>Solanum lycopersicum</i> L.	Solanaceae	Lycopene, Beta carotene	Anti-bacterial, anti-fungal, anti-mutagenic, Potent antioxidant, help in prevention of arteriosclerosis, cancer and diabetes	Panigrahi and Sahoo (2011) <sup>52</sup> , Chengaiyah et al. (2008) <sup>49</sup>
14	Pea	<i>Pisum sativum</i> L.	Fabaceae	Primary compounds like starch, protein, vitamin, mineral and rich in fibre. Phenolic acid, flavonoids and tannins.	Antioxidant and anti-cancer, antifertility and abortifacient effect. It inhibits osteoporosis and obesity. Maintains metabolic, cardiovascular and gastro intestinal health in humans. It is insulin resistant.	Dahl et al, (2012) <sup>53</sup>
15	Potato	<i>Solanum tuberosum</i> L.	Solanaceae	Glycoalkaloids, alpha-chaconine and alpha-solanine	Used in dyspepsia, skin disease and cancer. Due to high Potassium beneficial in high blood pressure and strokes.	Vlachojannis et al (2010) <sup>54</sup>
16	Sweet potato, Ganji, Kon	<i>Ipomoea batatas</i>	Convolvulaceae	Phenolic compounds, quercetin, $\beta$ -carotene, Fisetin, Merin, Lycopene, $\alpha$ -carotene, rich in vitamin A, B and	Rich antioxidant capacity, hypoglycemic, anti-ulcer, anti-microbial, anti-mutagenic, wound healing, anti-HIV, anti-hepatoprotective, Immune booster and	Lako, J. et al (2007) <sup>55</sup> , Panda et al. (2012) <sup>56</sup>

				vitamin C, Fe, Ca, P,	relieve diarrhea.	
17	Garlic	<i>Allium sativum</i> L.	Amaryllidaceae	allin, allicin, ajoene, allylpropyl, diallyl trisulphide, sally cystein, vinyl dithines, S-allyl marcaptocystein.	Antiparatic, anticancer, antiviral, antibacterial, antiallergic, immunomodulating, antihypertensive activity help in reducing migraine, blood pressure,	Benkeblia N. (2004) <sup>57</sup> Tan and Vanitha (2004) <sup>58</sup>
18	Onion	<i>Allium cepa</i> L.	Amaryllidaceae	Quercetin, volatile, sulfur compound	Helpful in anemia, skin disorders, stomach cancer, bacterial infection, eye infection, reducing low density lipoprotein, suppress plate, commonly used to treat cold, cough, bronchitis and influenza, prevent asthma attack.	Benkeblia N. (2004) <sup>57</sup> Tan and Vanitha (2004) <sup>58</sup> Augusti (1996) <sup>59</sup> Hofgen et al (2001) <sup>60</sup>
19	Ginger	<i>Zingiber officinale</i> L.	Zingiberaceae	Terpenes and oleoresin, Gingerols, shagaol	Antioxidant, antibacterial properties, combats travel sickness, helpful in cough and cold.	Tan and Vanitha (2004) <sup>58</sup> , Park et al (2012) <sup>61</sup>
20	Sitaphal	<i>Annona squamosa</i> L.	Annonaceae	Annotemoyin, annosquamosin	Have potential to treat wounds, cancer, bacterial infection, intestinal worms, Improve appetite, and Prevent stroke.	Sun et al, (2012) <sup>61</sup> , Panrasu and Suguna, (2012) <sup>63</sup>
21	Kudru, Ivy Guard	<i>Coccinia grandis</i> (L.) J. Voigt,	Cucurbitaceae	Polyprenol, aspirin, glibenclamide, ellagic acid, phenols terpenoids, flavonoids	Antioxidants activity, cholesterol lowering effects, anti-hyperglycemic activity, anti-cancerous.	Alamgir A. et al. (2014) <sup>64</sup> , Sutradhar B. k. et al. (2011) <sup>65</sup>

Table-3 Nutrients supplied by different class of vegetables

Class	Vegetables	Nutrients
Leafy vegetables	Beet, Cabbage, Salad, Spinach	DF, V, M
Stem vegetables	Asparagus, Celery	V, M
Fruit and flower vegetable	Tomato, Broccoli, Cauliflower, Pepper, Cucumber, Eggplant	DF, W, M
Root, Bulb and Tuber vegetables	Beet, Carrot, Fennel, Onion, Potato, Radish, Turnip	DF, CC, V, M

Note- CC-Complex Carbohydrate; DF-Dietary fiber; M-Minerals; V-Vitamins

Table 4: Colours of fruits and vegetables and their phytochemicals

Colours of fruits and vegetables	Phytochemicals present
Green	Glucosinolates, folate, vitamin-c, beta- carotene
Orange	$\alpha$ and $\beta$ -carotene, flavonoids, Zeaxanthin , Potassium ions
Red	Lycopene, Ellagic acid, Quercetin, Hesperidin
Red-purple	Anthocyanins, Lutein, Zeaxanthin, vitamin-c
Orange- yellow	Flavonoids and $\beta$ -cryptoxanthin
Yellow-Green	Zeaxanthin, lutein and xanthophyll
White	Dietary fiber and flavonoids



Figure-2: Different phytochemicals derived from fruits and vegetables used as nutraceutical.



Figure-3: Photographs of different colours of commonly available fruits and vegetables

## Conclusion

Fruits and vegetables are very important components of a healthy diet. If we consume them daily in sufficient amount then, could help to prevent many diseases. The main aspect of this to increased awareness among the people for the beneficial effect of nutraceuticals in day to day life. Fruits and vegetables are commonly used by us can serve an important prophylactic and therapeutic role in gradient of food in day to day life. Increase in their consumption is potent practical strategy optimize the health of human as well as their companion animals. The present information is just the beginning, yet a large volume of indigenous folklore and undiscovered value remain too paved through. Therefore, there is an urgent need to explore the beneficial and medical properties of local and less used fruits and vegetables.

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