



RESEARCH ARTICLE

COLOURED RAINBOW OF FRUITS & VEGETABLES-A DAILY HEALTHY BITE.

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ABSTRACT

By eating fruits and vegetables of a variety of different colours, one can get the best all-around health benefits. Each different colour fruit and vegetables contains unique health components that are essential to our health. Fruits and vegetables are very important to our health because they are whole foods, created by nature, that are rich in a large amount of nutrients. People need different amounts of fruits and vegetables depending on their age, gender and amount of daily physical activity. The phrase "eating a rainbow" of fruits and vegetables is a simple way of remembering to get as much color variety in diet as possible to maximize intake of a broad range of nutrients. The colours of fruits and vegetables are a small clue as to what vitamins and nutrients are included. By getting a variety of different colored fruits and vegetables we are guaranteed a diverse amount of essential vitamins and minerals. However, as compared to the amount of money spent on pre-packaged, processed, and fast foods, most fruits and vegetables (with the exception of those that are not in season) are not all that expensive. Because frozen fruits and vegetables retain the majority of their nutritional value, they can be an excellent alternative when certain foods are out of season. Someone who is not able to eat five servings of fruits and vegetables each day can also drink fruit and vegetable drinks in their place. Although this shouldn't become a habit, fruit and vegetable drink mixes can be an excellent substitute while travelling.

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INTRODUCTION

"A rainbow of foods creates a palette of nutrients, each with a different bundle of potential benefits for a healthful eating plan..."

"Adding a splash of colourful seasonal foods to your plate makes for more than just a festive meal. A rainbow of foods creates a palette of nutrients, each with a different bundle of potential benefits for a healthful eating plan."

"Food variety supplies different nutrients, so to maximize the nutritional value of your meal, include healthful choices in a variety of colours."

By eating fruits and vegetables of a variety of different colours, one can get the best all-around health benefits. Each different colour fruit and vegetables contains unique health components that are essential to our health. Fruits and vegetables are very important to our health because they are whole foods, created by nature, that are rich in a large amount of nutrients. The processed foods that we so commonly eat, can never compare to the health benefits provided by strawberries or broccoli,

which have fibre, vitamins, and enzymes built right in. Eating plenty of healthy vegetables and fruits helps prevent heart disease and strokes, diverticulitis, controls blood pressure, prevent some types of cancers, and guards against cataract and macular degeneration or vision loss. The need for fruits and vegetables in diet is growing rapidly with the type 2 diabetes, heart disease, and high cholesterol, hypertension.

People need different amounts of fruits and vegetables depending on their age, gender and amount of daily physical activity. For example, the recommendation for a 40-year-old male who gets about 60 minutes of daily physical activity is 2 cups of fruit and 3½ cups of vegetables. The recommendation for a 15-year-old female who gets less than 30 minutes of daily physical activity is 1½ cups of fruit and 2½ cups of vegetables. To meet their daily goal, most people need to increase the amount of fruits and vegetables they eat every day. All product forms count – fresh, frozen, canned, dried and 100% juice. Whole fruits, however, usually contain more fiber than juice. Scientists are regularly reporting new health benefits associated with fruits and vegetables. Eating more fruits and vegetables is a worthwhile goal. Eating a variety of different colors of fruits

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and vegetables every day is a new way of thinking about meeting the goal (1).

Red fruits and vegetables are colored by natural plant pigments called “lycopene” or “anthocyanins.” They contain Ellagic acid, Quercetin, and Hesperidin. Lycopene in tomatoes, watermelon and pink grapefruit, for example, may help reduce risk of several types of cancer, especially prostate cancer. Lycopene in foods containing cooked tomatoes, such as spaghetti sauce, and a small amount of fat are absorbed better than lycopene from raw tomatoes. Anthocyanins in strawberries, raspberries, red grapes and other fruits and vegetables act as powerful antioxidants that protect cells from damage. Antioxidants are linked with keeping hearts healthy, too. These nutrients reduce the risk of prostate cancer, lower blood pressure, reduce tumor growth and LDL cholesterol levels, scavenge harmful free-radicals, and support joint tissue in arthritis cases.

Examples of the Red group-Red apples, Red peppers, Beets, Pomegranates, Red cabbage, Red potatoes, Cherries, Radishes, Cranberries, Raspberries, Pink grapefruit, Rhubarb, Red grapes, Strawberries, Tomatoes, Watermelon.

- **Cherries** - This delicious fruit is high in antioxidants that have been shown to protect against heart disease, diabetes, and arthritis. A rich source of antioxidants, tart cherries also help reduce inflammation in the body and relieve pain from gout and arthritis.
- **Cranberries** - High in antioxidants and proanthocyanidins, cranberries have been shown to prevent bacteria from adhering to the urinary tract wall and reduce inflammation in the body.
- **Red bell peppers** - Bell peppers are low in calories and fat and high in vitamin C and fiber. Eating bell peppers has been linked to increased immunity, improved digestion, lower cholesterol, and a decreased risk of colon cancer.
- **Tomatoes**- High in the antioxidant lycopene, tomatoes have been shown to help reduce damage to our cells and decrease the risk of cardiovascular disease and diabetes.
- **Beets**- This low calorie veggie is high in fiber, folate, and vitamins A, C, and K. Beets have been shown to optimize digestive health, decrease inflammation, and help fight heart disease.

Orange/Yellow fruits and vegetables are usually colored by natural plant pigments called “carotenoids.” They contain Beta-carotene, zeaxanthin, flavonoids, lycopene, potassium, and vitamin C. Beta-carotene in sweet potatoes, pumpkins and carrots is converted to vitamin A, which helps maintain healthy mucous membranes and healthy eyes. Scientists have also reported that carotenoid-rich foods can help reduce risk of cancer, heart disease and can improve immune system function. One study found that people who ate a diet high in carotenoid-rich vegetables were 43 percent less likely to develop age-related macular degeneration, an eye disorder common among the elderly, which can lead to blindness. Carotenoids also may be good for your heart. One study found that men with high cholesterol who ate plenty of vegetables high in carotenoids had a 36 percent lower chance of heart

attack and death than their counterparts who shunned vegetables. Citrus fruits like oranges are not a good source of vitamin A. They are an excellent source of vitamin C and folate, a B vitamin that helps reduce risk of birth defects. These nutrients reduce age-related macular degeneration and the risk of prostate cancer, lower LDL cholesterol and blood pressure, promote collagen formation and healthy joints, fight harmful free radicals, encourage alkaline balance, and work with magnesium and calcium to build healthy bones.

Examples of the orange/yellow group-Yellow apples, Peaches, Apricots, Pears, Butternut squash, Yellow peppers, Cantaloupe, Persimmons, Carrots, Pineapple, Grapefruit, Pumpkin, Lemons, Rutabagas, Mangoes, Yellow summer or winter, Nectarines squash, Oranges, Sweet corn, Papayas, Sweet potatoes, Tangerines, Yellow tomatoes, Yellow watermelon.

- **Carrots** - Carrots are high in vitamin A, which helps maintain the integrity of the skin, and beta carotene, which has been associated with boosting the immune system and potentially reducing the chances of skin cancer.
- **Oranges** - This fruit is high in vitamin A and C, which has been linked to increased immunity, heart health, and healthier skin. Also high in magnesium and fiber, oranges can help strengthen bones and improve digestion.
- **Sweet potatoes** - Often touted as one of the healthiest veggies we can eat, sweet potatoes are high in fiber, vitamins A and C, iron, and antioxidants. Eating sweet potatoes has been shown to promote healthy skin, increased immunity, and a decreased risk of cancer.
- **Peaches** - High in vitamin A, C, E, K, and fiber, peaches have been shown to help prevent cellular damage, promote healthier digestion, reduce inflammation in the body, and help reduce your risk of cancer.
- **Pineapple** - Cholesterol and fat-free, pineapple is high in bromelain, an enzyme that helps regulate and neutralize body fluids and aids in digestion. Its high vitamin C content has also been linked to decrease in heart disease, cancer, cataracts, and stroke.
- **Yellow peppers** – High in vitamin C and A, yellow peppers have been linked to increased immune system and healthy skin. Yellow peppers are also high in carotenoids, which help protect from heart disease.

Star fruit - Caramobla, or more commonly known as star fruit, is high in high in vitamin C and calcium. This fruit has been linked to increased immunity, bone health, and muscle contractions.

Green fruits and vegetables are colored by natural plant pigment called “chlorophyll.” They contain Chlorophyll, fiber, lutein, zeaxanthin, calcium, folate, vitamin C, calcium, and Beta-carotene. Some members of the green group, including spinach and other dark leafy greens, green peppers, peas, cucumber and celery, contain lutein. Lutein works with another chemical, zeaxanthin, found in corn, red peppers, oranges, grapes and egg yolks to help keep eyes healthy. Together, these chemicals may help reduce risk of cataracts and age-related macular degeneration, which can lead to blindness if untreated.

The “indoles” in broccoli, cauliflower, cabbage and other cruciferous vegetables may help protect against some types of cancer. Leafy greens such as spinach and broccoli are excellent sources of folate, a B vitamin that helps reduce risk of birth defects. The nutrients found in these vegetables reduce cancer risks, lower blood pressure and LDL cholesterol levels, normalize digestion time, support retinal health and vision, fight harmful free-radicals, and boost immune system activity.

Examples of the green group-Green apples, Honeydew melon, Artichokes, Kiwi, Asparagus, Lettuce, Avocados, Limes, Green beans, Green onions, Broccoli, Peas, Brussels sprouts, Green pepper, Green cabbage, Spinach, Cucumbers, Zucchini, Green grapes.

- **Broccoli** – High in calcium and iron, this veggie has been linked to stronger teeth, bones, and muscles, and a decreased risk of cancer.
- **Spinach** – This leafy green is high in antioxidants and vitamin K, which helps strength bones.
- **Kiwi** – Kiwi is high in folate, vitamin E, and glutathione, which all help decrease the risk of heart disease and promote optimal overall health.

Blue/purple fruits and vegetables are colored by natural plant pigments called “anthocyanins.” They contain Lutein, zeaxanthin, resveratrol, vitamin C, fiber, flavonoids, ellagic acid, and quercetin. Anthocyanins in blueberries, grapes and raisins act as powerful antioxidants that protect cells from damage. They may help reduce risk of cancer, stroke and heart disease. Other studies have shown that eating more blueberries is linked with improved memory function and healthy aging. These nutrients support retinal health, lower LDL cholesterol, boost immune system activity, support healthy digestion, improve calcium and other mineral absorption, fight inflammation, reduce tumor growth, act as an ant carcinogens in the digestive tract, and limit the activity of cancer cells.

Examples of the Blue/Purple group-Blackberries, Purple grapes, Blueberries, Raisins, Eggplant, Figs, June berries, Plums, Prunes.

- **Blueberries** -Blueberries are high in fiber (2.4 g per 2/3 cup), vitamin E and C, and antioxidants. Eating blueberries has been linked to improved cholesterol, increased urinary-tract health, and a boost in brain activity.
- **Blackberries** - These nutrient-packed berries are high in fiber, vitamin K (promotes calcium absorption and bone health), and high in antioxidants that improve overall health. Research has also linked blackberries to increased immunity, improved heart health, lower cholesterol, and decreased cancer risk.
- **Plums**- Plums are high in vitamin B, which helps metabolize carbohydrates, proteins, and fat. High in vitamin K, plums also help promote bone health.
- **Eggplant** - In addition to being high in fiber (8 percent of your daily needs), eggplant is also high in vitamin C, calcium, and phosphorus which promote strong bones and teeth.

White fruits and vegetables are colored by pigments called “anthoxanthins.”They contain Beta-glucans, EGCG, SDG, and lignin. They may contain health-promoting chemicals such as

allicin, which may help lower cholesterol and blood pressure and may help reduce risk of stomach cancer and heart disease. Some members of the white group, such as bananas and potatoes, are good sources of the mineral potassium, too. They provide powerful immune boosting activity. These nutrients also activate natural killer B and T cells, reduce the risk of colon, breast, and prostate cancers, and balance hormone levels, reducing the risk of hormone-related cancers.

Examples of the White group-Bananas, Onions, Cauliflower, Parsnips, Garlic, Potatoes, Ginger, Turnips, Jicama and Mushrooms.

- **Garlic** – In the same family as chives and onions, this powerful, potent food has been linked to heart health and decreased cancer risk. Garlic also has anti-microbial compounds.
- **Onions** – In addition to having powerful sulfur-bearing compounds that work as anti-microbial agents (similar to garlic), onions have also been shown to help lower blood sugar levels and improve heart health by lowering blood pressure and cholesterol. Onions are also high in the flavonoids quercetin, which has been linked to cell protection and slower tumor growth.
- **Cauliflower** – High in powerful antioxidants such as manganese and vitamin C. One cup of cauliflower has 52 mg of vitamin C, compared to 64 mg in a medium orange. This healthy food has also been linked to increased immunity (2).

Potential Compounds in Fruits and Vegetables

Quercetin-Found in apples, onions and other citrus fruits, not only prevents LDL cholesterol oxidation, but also helps the body cope with allergens and other lung and breathing problems.

Ellagic acid-Mainly found in raspberries, strawberries, pomegranates, and walnuts, has been proven in many clinical studies to act as an antioxidant and anticarcinogens in the gastrointestinal tract. This nutrient also has been proven to have an anti-proliferative effect on cancer cells, because it decreases their ATP production. The best-known of the carotenoids, beta-carotene, is converted into vitamin A upon entering the liver. Although being known for its positive effects on eyesight, it has also been proven to decrease cholesterol levels in the liver. Clinical studies have proven that lycopene, mainly found in tomatoes, may decrease the risk of prostate cancer, as well as protect against heart disease. Lutein, which is found in blueberries and members of the squash family, is important for healthy eyes. However, it does support your heart too, helping to prevent against coronary artery disease. Along with the above stated nutrients, there are even more nutrients found in fruits and vegetables that provide a great deal of support to our body. Almost everyone has heard of vitamin C, which keeps our immune system strong; speeds wound healing, and promote strong muscles and joints. This nutrient is scattered throughout the spectrum of fruits, but commonly associated with oranges and other citrus fruits. Potassium, which is the nutrient most Americans are deficient in, does great things for our hearts, and lowers blood pressure. Another good food component many people don't get enough of is fibre, found in fruits, vegetables, and whole grains.

Flavonoids-Include anthocyanins, flavones, isoflavones, proanthocyanidins, quercetin and more, are found almost everywhere. They are responsible for the colours in the skins of fruits and vegetables and help to stop the growth of tumor cells and potent antioxidants. They also can reduce inflammation.

Beta-glucan-Found in mushrooms, stabilizes and balances the body's immune system by supporting white blood cells. EGCG is found in tea and has been shown to reduce the risk of colon and breast cancer. It boosts the immune system and encourages T-cell formation, which defends our body against sickness and disease.

Bioflavonoids-Found in citrus fruits, are considered a companion to vitamin C because they extend the value of it in the body. These nutrients have the capabilities to lower cholesterol levels and support joint collagen in arthritis cases (3, 4).

- Enjoy fruit smoothies for breakfast or snacks.
- Pack fresh or dried fruits for quick snacks.

Fruit and vegetable safety

Improperly handled fruits and vegetables can become contaminated with *Salmonella* and *E. coli*, potentially leading to food borne illnesses. Fresh fruits and vegetables should be washed well with plenty of running water to be safe. Cross contamination must also be avoided.

- Examine fresh fruits and vegetables for signs of freshness before purchase.
- Pack fresh produce away from meats in the grocery cart and in separate bags.
- Before handling, wash hands with warm water and soap for 20 seconds.

Chart of Colored Vegetables and Fruit

| Green | White | Red | Yellow/Orange | Blue/Purple |
|------------------|---------------------|---------------------|----------------------|-----------------------|
| Artichokes | Bananas | Beets | Apricots | Black currants |
| Arugula | Brown pears | Blood oranges | Butternut squash | Black salsify |
| Asparagus | Cauliflower | Cherries | Cantaloupe | Blackberries |
| Avocados | Dates | Cranberries | Cape Gooseberries | Blueberries |
| Broccoflower | Garlic | Guava | Carrots | Dried plums |
| Broccoli | Ginger | Papaya | Golden kiwifruit | Eggplant |
| Broccoli rabe | Jerusalem artichoke | Pink grapefruit | Grapefruit | Elderberries |
| Brussels sprouts | Jicama | Pink/Red grapefruit | Lemon | Grapes |
| Celery | Kohlrabi | Pomegranate | Mangoes | Plums |
| Chayote | Mushrooms | Pomegranates | Nectarines | Pomegranates |
| squash | Onions | Radicchio | Oranges | Prunes |
| Chinese cabbage | Parsnips | Radishes | Papayas | Purple Belgian endive |
| Cucumbers | Potatoes | Raspberries | Peaches | Purple Potatoes |
| Endive | Shallots | Red apples | Persimmons | Purple asparagus |
| Green apples | Turnips | Red bell peppers | Pineapples | Purple cabbage |
| Green beans | White Corn | Red chili pepper | Pumpkin | Purple carrots |
| Green cabbage | White nectarines | Red grapes | Rutabagas | Purple figs |
| Green grapes | White peaches | Red onions | Sweet corn | Purple grapes |
| Green onion | | Red pears | Sweet potatoes | Purple peppers |
| Green pears | | Red peppers | Tangerines | Raisins |
| Green pepper | | Red potatoes | Yellow apples | |
| Honeydew | | Rhubarb | Yellow beets | |
| Kiwifruit | | Strawberries | Yellow figs | |
| Leafy greens | | Tomatoes | Yellow pears | |
| Leeks | | Watermelon | Yellow peppers | |
| Lettuce | | | Yellow potatoes | |
| Limes | | | Yellow summer squash | |
| Okra | | | Yellow tomatoes | |
| Peas | | | Yellow watermelon | |
| Sno Peas | | | Yellow winter squash | |
| Spinach | | | | |
| Sugar snap peas | | | | |
| Watercress | | | | |
| Zucchini | | | | |

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Tips to increase fruits and vegetables in diet

- Keep cleaned fruits and vegetables in the refrigerator - ready to eat.
- Have vegetables with low-fat dip for a snack.
- Drink 100% fruit juice instead of fruit-fl avoid drinks or soda pop.
- Have fruit for dessert.
- Keep a bowl of apples, bananas and/or oranges on the table.
- Choose a side salad made with a variety of leafy greens.
- Add lettuce, onions, peppers and/or tomatoes to sandwiches.

- Rinse all fresh produce with running water, using a brush if necessary. Do not use soap.
- Remove outer leaves of lettuce and cabbage.
- Separate cutting boards should be used.
- Cutting boards should be cleaned with soap, water and Sanitize it.
- Serve cut-up fresh produce in containers over ice.
- Store cut-up fruits at or below 40 degrees (5).

CONCLUSION

The phrase "eating a rainbow" of fruits and vegetables is a simple way of remembering to get as much color variety in diet as possible to maximize intake of a broad range of nutrients.

The colours of fruits and vegetables are a small clue as to what vitamins and nutrients are included. By getting a variety of different colored fruits and vegetables we are guaranteed a diverse amount of essential vitamins and minerals. The number one excuse for not eating the required five servings of fruits and vegetables each day is they are too expensive. However, as compared to the amount of money spent on pre-packaged, processed, and fast foods, most fruits and vegetables (with the exception of those that are not in season) are not all that expensive. Because frozen fruits and vegetables retain the majority of their nutritional value, they can be an excellent alternative when certain foods are out of season.

Someone who is not able to eat five servings of fruits and vegetables each day can also drink fruit and vegetable drinks in their place. Although this shouldn't become a habit, fruit and vegetable drink mixes can be an excellent substitute while travelling (6).

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