# Importance of Fruits, Nuts, and Vegetables in Human Nutrition and Health

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Fruits, nuts, and vegetables play a significant role in human nutrition, especially as sources of vitamins (C, A, $B_6$, thiamine, niacin, E), minerals, and dietary fiber (Quebedeaux and Bliss, 1988; Quebedeaux and Eisa, 1990; Wargovich, 2000). Their contribution as a group is estimated at 91% of vitamin C, 48% of vitamin A, 27% of vitamin $B_6$, 17% of thiamine, and 15% of niacin in the U.S. diet. Fruits and vegetables also supply 16% of magnesium, 19% of iron, and 9% of the calories. Legume vegetables, potatoes, and tree nuts (such as almond, filbert, pecan, pistachio, and walnut) contribute about 5% of the per capita availability of proteins in the U.S. diet, and their proteins are of high quality as to their content of essential amino acids. Nuts are a good source of essential fatty acids, fiber, vitamin E, and minerals. Other important nutrients supplied by fruits and vegetables include folacin, riboflavin, zinc, calcium, potassium, and phosphorus. For more information on food composition and nutritional value access one of the following Internet web sites:

- www.nal.usda.gov/fnic/foodcomp
- www.nutrition.gov

Climatic conditions, especially temperature and light intensity, have a strong effect on the nutritional quality of fruits and vegetables. Soil type, the rootstock used for fruit trees, mulching, irrigation, fertilization, and other cultural practices influence the water and nutrient supply to the plant, which can affect the composition and quality attributes (appearance, texture, taste and aroma) of the harvested plant parts (Goldman et al., 1999). Maturity at harvest and harvesting method influence the commodity's quality and extent of physical injuries. Delays between harvest and consumption or processing can result in losses of flavor and nutritional quality. The magnitude of these losses increases with exposure to temperatures, relative humidities, and/or concentrations of oxygen, carbon dioxide, and ethylene outside the ranges that are optimum for each commodity during the entire postharvest handling system (Lee and Kader, 2000). Furthermore, processing and cooking methods can greatly affect the nutritional value of fruits and vegetables.

Fruits, nuts, and vegetables in the daily diet have been strongly associated with reduced risk for some forms of cancer, heart disease, stroke, and other chronic diseases (Prior and Cao, 2000; Produce for Better Health Foundation, 1999; Quebedeaux and Bliss, 1988; Quebedeaux and Eisa, 1990; Southon, 2000; Tomas-Barberan and Robins, 1997; Wargovich, 2000). Some components of fruits and vegetables are strong antioxidants and function to modify the metabolic activation and detoxification/disposition of carcinogens, or even influence processes that alter the course of the tumor cell (Wargovich, 2000). Although antioxidant capacity varies greatly among fruits and vegetables (Prior and Cao, 2000) it is better to consume a variety of commodities rather than limiting consumption to a few with the highest antioxidant capacity. The USDA 2000 Dietary Guidelines (USDA, 2000) encourage consumers to: (1) enjoy five a day, i.e., eat at least 2 servings of fruits and at least 3 servings of vegetables each day, (2) choose fresh, frozen, dried, or canned forms of a variety of colors and kinds, and (3) choose dark-green leafy vegetables, orange fruits and vegetables, and cooked dry beans and peas often. In some countries, consumers are encouraged to eat up to 10 servings of fruits and vegetables per day.

There is increasing evidence that consumption of whole foods is better than isolated food components (such as dietary supplements and nutracenticals). For example, increased consumption of carotenoid-rich fruits and vegetables was more effective than carotenoid supplements in increasing LDL oxidation resistance, lowering DNA damage, and inducing higher repair activity in human volunteers who participated in a study conducted in France, Italy, Netherlands, and

Spain (Southon, 2000). Similar comparative studies are needed on other constituents of fruits and vegetables and on the bioavailability of nutrients taken as dietary supplements or as foods that contain these nutrients.

Examples of the components of fruits and vegetables that have positive effects on human health and their important sources are shown in Table 1. Some changes in this table are likely as the results of additional studies on effects of phytonutrients and their bioavailability on human health become available in the next few years. Meanwhile it is important to evaluate the validity and dependability of the results of every study before reaching conclusions for the benefit of consumers.

Table 1. Constituents of fruits and vegetables that have a positive impact on human health and their sources (Produce for Better Health Foundation, 1999; USDA, 2000).

| Constituent | Sources | Impacted human diseases |
|---|---|---|
| Antioxidants | | cancer, cataracts, heart disease, stroke |
| Vitamin C | broccoli, cabbage, cantaloupe, citrus fruits, guava, kiwifruit, leafy greens, pepper, pineapple, potato, strawberry, tomato | |
| Vitamin A (carotenoids) | dark-green vegetables (such as collards, spinach, and turnip greens), orange vegetables (such as carrots, pumpkin, and sweet potato), orange-flesh fruits (such as apricot, cantaloupe, mango, nectarine, orange, papaya, peach, persimmon, and pineapple), tomato | |
| Vitamin E | nuts (such as almonds, cashew nuts, filberts, macadamias, pecans, pistachios, and walnuts) | |
| Flavonoids | red, blue, and purple fruits (such as apple, blackberry, blueberry, cranberry, grape, nectarine, peach, plum & prune, pomegranate, raspberry, and strawberry) | |
| Fiber | most fresh fruits and vegetables, nuts, cooked dry beans and peas | diabetes, heart disease |
| Folate | dark-green leafy vegetables (such as spinach, mustard greens, and romaine lettuce), legumes (cooked dry beans and peas, green peas), oranges | birth defects, cancer, heart disease |
| Potassium | baked potato or sweet potato, banana & plantain, cooked dry beans, cooked greens, dried fruits (such as apricots and prunes), winter (orange) squash | hypertension, stroke |

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