

NUTRACEUTICAL HEALTH BENEFITS OF STRAWBERRY

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A Nutraceutical is defined as any product derived from food or part of a food sources with extra health benefits in addition to the basic nutritional value found in foods. They promote general well-being, control symptoms and prevent malignant processes and consider as non-specific biological therapies. They have been shown to impose essential roles in enhancing the immune status and susceptibility to certain disease states to human body. Berries can be considered as nutraceutical as they are rich source of phenolic compounds which impart health benefits to humans, improve the immune system and reduce obesity-related disorders, enhanced brain function, arthritis and various cardiovascular diseases.

Strawberry (*Fragaria ananassa*) is one of the most refreshing, delicious and soft fruits. It is widely distributed fruit-crop because of its heterozygous nature and broad range of environmental adaptations. Strawberries are well-loved fruit not only because of its attractive color, aroma, fine texture and luscious taste but also for its high economical and nutritional values, as it contains essential minerals, organic (amino) acids, vitamins and antioxidants. It is commercially available as processed products such as shakes, juices, nectar, and puree which can be easily incorporated in our daily diet and moreover, strawberries are the most demanded berries in fresh and frozen forms and derived products like dried and canned forms, yogurts, beverages, jams, and jellies. Besides this, strawberry flavor is used extensively in the

food industry for the production of beverages, confectioneries, bakery fillings, yoghurts, ice creams, cake mixes etc. Strawberries can also be added as a burst of sweetness to a healthful diet.



BIOACTIVE COMPOUNDS IN STRAWBERRY

Berries are rich in both nutritive and non-nutritive compounds such as vitamins, dietary fibers, minerals and polyphenols. The most important polyphenolic compound in strawberry is anthocyanins which can help in reducing the risk of heart attack. Moreover, the presence of antioxidants in strawberry reduces the formation of harmful blood clots due to high potassium content. The strawberry rich diet not only helps in improving the digestion issues, diabetes, neurodegenerative disease and cardio vascular but also helps in regulating the cellular activity and fight off the free radicals on human body due to the presence of flavonoids in strawberry. Health benefits like prevention of inflammation, oxidative stress, cardiovascular diseases, diabetes, cancer and obesity have been related with the antioxidant activity of phenolic compounds, mainly ellagitannins and anthocyanins present in strawberry. Healthy properties of strawberries are not only associated with the amount of bioactive compounds, but also with the degree of transformation during digestion. In fact, in strawberry fruits, the chemical nature and/or the integrity of bioactive compounds can be altered by the specific conditions of the gastrointestinal tract. For example, a major part of the polyphenols ingested is not absorbed through the gut barrier while anthocyanins are directly and quickly absorbed from the stomach and from the small intestine

BRIEF HISTORY OF STRAWBERRY

Strawberry (*Fragaria ananassa*), a dicotyledonous, perennial herb grown in most arable regions of the world. *Fragaria vesca*, the alpine strawberry, was the first strawberry domesticated in the old world. In the 1300's, the ancient Romans and Greeks originally cultivated it in gardens and was being grown across Europe and in the 1500's and 1600's *Fragaria vesca* gains its widest popularity in the in Europe before the introduction of strawberry species from the New World. However, across the mid 1700's *F. chiloensis* imported from Chile were planted in France near *F. virginiana* transplanted from the eastern North America and cultivated strawberry (*Fragaria x ananassa Duch*), has evolved as natural hybrid between the *F. virginiana Duch* and *F. chiloensis* (L) Duch. It was believed that the ancient Romans used the leaves of strawberry to create medicines to alleviate depression and other ailments and they also believed that strawberry fruit has healing power.

NUTRITIONAL VALUE OF STRAWBERRY

Strawberry is a rich source of vitamin C, potassium, folic acid, and fiber. All these nutrients are essential for the human body for performing daily activity. It was assumed that one serving of eight strawberries provides more vitamin C than an orange. Strawberries are also sodium-free, fat-free, cholesterol-free, low-calorie food packed with along high amount of valuable vitamins and minerals specifically potassium 254 mg and other like calcium of 27 mg, phosphorus 40 mg, magnesium 22mg and vitamin C 97.60 mg. It also contain important nutrients such as carbohydrates with 12.75 g, protein of 1.11 g, dietary fiber of 3.30 g and energy of 53.0 Kcal and iron with 0.68

mg, vitamin A of 28 IU, folate of 40 micrograms (mcg) . It is among the top 20 fruits in providing antioxidant including anthocyanins, catechin, quercetin and kaempferol, organic acids (citric, malic, oxalic, salicylic and ellagic). Strawberries were recently incorporated among the 100 richest sources of dietary polyphenols, and it is ranked as 89 on the list of foods and beverages providing more than 1 mg total polyphenols per serving. These polyphenols account for most of the health benefits of strawberries. It is also a good source of water as ripe strawberries are composed of approximately 90% water and 10% total soluble solids and glucose and fructose are the main soluble sugar components in strawberries. In general strawberry flavor is a complex combination of sweetness, acidity and aroma.

STRAWBERRY CULTIVATION

Strawberry thrives best in temperate climate. It requires a well-drained medium loam soil, rich in organic matter with pH from 5.7 to 6.5. They are planted on flat beds, in the form of hill rows or matted rows, or planted on raised beds with 4 x 3 meters or 4 x 4 meters with planting distance 45 cm from plant to plant and 60 to 75 cm row to row. During strawberry plantation it is very important to incorporate liberal organic matter. Strawberry is a short day plant, which requires exposure to about 10 days of less than 8 hours sunshine for initiation of flowering. Botanically, the fruit of strawberry is "accessory fruit" and is not a true berry. In cold climate the soil is covered with a mulch in winter to protect the roots from cold injury. The mulch keeps the fruits free from soil, reduces decay of fruits, conserves soil moisture, lowers soil temperature in hot weather. The fruit ripens during late February to April in the plains and during May and June at high elevations like Mahabaleshwar, Nainital and Kashmir. Harvesting should be done early in the morning in dry conditions. Strawberries are highly perishable and hence a great deal of care in harvesting and handling is required.

NUTRACEUTICAL PROPERTIES OF STRAWBERRY

- Neuroprotective
- Cardioprotective
- Antioxidant
- Anti- microbial
- Anti cancer



PREVENT HEART ATTACKS (CARDIOPROTECTIVE)

The ingestion of strawberry may help in regulating blood pressure as it contains a high amount of potassium which have a lowering effect on high blood pressure. Moreover, anthocyanin present in strawberry also reduce the risk of high blood pressure through relaxation of lining of the blood vessels and regulation of lipid profile. Anthocyanin rich strawberries would also help in lowering down the total cholesterol level in the body and help in normalizing the blood glucose level.

FIGHT CANCER (ANTIOXIDANT)

Consumption of strawberry fruits are gaining attention due to its antioxidant capacity which play an important role in controlling oxidative reactions in the human body and exhibit anticarcinogenic. The most common phenolic compounds in the strawberry fruit with strong antioxidant capacity are flavonoids and phenolic acids which helps in inducing an improvement in plasma antioxidant status and vitamin C concentrations.

KEEP YOUR BRAIN YOUNG (NEUROPROTECTIVE)

The presence of plant phenols such as phenolic acids, terpenes and flavonoids in berries exert a potential effect regarding neurodegenerative disorders and their regular consumption may help the human body to fight off the mental decline by an average of two and a half years.

MAY FIGHT INFLAMMATION (ANTI-INFLAMMATORY)

Berries play a major role in preventing inflammation as they contain quercetin and vitamin C. Intake of quercetin, along with regular exercise, can reduce atherosclerotic plaque formation. And the presence of vitamin C plays a role in easing the symptoms of arthritis and gout.

MAY FIGHT AGAINST MICROBES (ANTI-MICROBIAL)

Anti-microbial activity of strawberry can be related to the presence of polyphenols having inhibitory effects on pathogenic viruses, bacteria, yeast, and fungi. The antimicrobial mechanism of berries may include inhibition of extracellular enzymes, deprivation of the substrates required for microbial growth, and anti-adherence of bacteria to epithelial cells of the human body. Ellagitannins are the principal antimicrobial phenolics against these pathogens.

FIGHT AGAINST CANCER (ANTI-CANCER)

Strawberries help in defending the human body from cancer as they significantly reduced excretion of carcinogen N-nitrosodimethylamine (NDMA) in urine by 70%, which is the main cause for various cancers in the body like lung, liver, pancreas, kidney, etc. Furthermore, ellagic acid and ellagitannins in berries have been shown to block the initiation of cancer cell creations.

CONCLUSION

Both in fresh and processed forms, strawberries possess a remarkable nutritional and phytochemical content such as folates, minerals, and vitamins, anthocyanins, ellagitannins, quercetin, and catechin. They can be considered as a "functional food," providing health benefits beyond basic nutrition. The extraordinary content of bioactive constituents seems to be responsible for medicinal and therapeutic effects on human health. Thus, strawberry cultivation provides a fruit with antioxidant and nutraceutical properties with respect to the commercial product.



STRAWBERRIES