

Nutraceuticals: Emerging Trends in Healthcare and Populace Security

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Editorial

One of the items on wish list of biotechnologists is to engineer genomes of plants to tailor high-value traits other than agronomic, pathological and entomological in nature. Amongst high-value traits are the introduction of nutrition and related characters. 'Nutraceuticals' is a portmanteau of 'nutrition' and 'pharmaceuticals', hence the word implies that nutraceuticals are products regulated as medicine, food ingredients and dietary supplements. These products not only provide protection against various diseases caused due to the deficiency of the nutrients, but also have physiological benefits. Traditionally, nutraceuticals have been employed in the form of medicinal plants, etc, but in this modern era, nutraceuticals are being used in a variety of perspectives, such as nutrition and medicine.

Nutraceuticals have found their uses as dietary supplements and food ingredients. Produced in a variety of forms (gel-caps, tablets and syrups, etc), these dietary supplements may contain vitamins, minerals, botanical extracts, essential amino acids, Poly Unsaturated Fatty Acids (PUFA) and enzymes, etc, that are probably deficient in most of our diets. Another category is of the functional foods. Iron-fortified products are the prime examples of it. Just by addition of iron-containing compounds during the grinding of wheat, otherwise deficient in iron, protects the wheat-dependant populace from diseases caused by deficiency such as iron-deficiency anemias, etc. Other examples include purple cauliflower and purple potatoes, having additional *anthocyanin* content. Golden rice and Golden potatoes as well as Provitamin-A-fortified maize are crops that have caught interest of nutritionists globally. Natural sources of Provitamin-A and carotenoids, these crops have a huge potential of reducing Vitamin A deficiency diseases e.g. Night blindness, xerophthalmia etc those are prevalent in many African and Asian countries. Similarly, Quinoa is of great nutritional value. Laden with fiber, vitamins and minerals, this plant also is rich in lysine, hence its proteins are nutritionally more complete than many vegetables [1]. Thus, quinoa holds great potential as a Nutraceutical, to curb the malnutrition rampant in many third-world countries, the likes of Pakistan, India, Nepal, Bangladesh and several African nations.

Perhaps the most researched aspects of nutraceuticals are their use in medicine, to cure a variety of diseases such as Cancer, Osteoarthritis, Cardiovascular Disorders, etc. Several plants, including food-crops have been found to contain certain compounds that help prevent, if not cure some of the aforementioned ailments. Just as Hippocrates once said "Let food be thy medicine". Even in this era of rapid medicine evolution, cancer remains a major threat to population and a leading cause of mortality in developed nations. Over the years, several plants have been shown to contain compounds which, if incorporated into life-style early on, reduce the risk of cancer by as much as 33%. For example, blue maize has been found to be an effective nutraceutical in prevention of several types of cancers, such as colon cancer, etc [2]. Several chemotherapeutic agents such as Taxol, Vincristine and

Vinblastine are derived from plants such as *Taxus brevifolia* and alkaloids of *Vinca* species. Nutraceuticals have also been shown to reduce the toxic effects of chemotherapeutic agents and radiation therapies [3].

Bacterial infections have also surfaced as major causes of morbidity in the modern world and the growing resistance to artificial antibiotics is a cause of serious concern. Extensive researches have proven that certain medicinal plants, seven in numbers, have shown significant activity against *H. pylori* infections. These include: *Artemisia ludoviciana*, *Cuphea aequipetala*, *Ludwigia repens*, *Mentha piperita*, *Persea americana*, *Annona cherimola*, *Guaiacum coulteri*, and *Moussonia depeana* [4]. Similarly, turmeric and 'Neem' are traditionally known anti-septics.

Alzheimer's disease is another leading cause of morbidity and mortality that primarily affects people 40 years of age or older. THC, a compound found in marijuana and cannabis has been proven to prevent and destroy the neurodegenerative β -Amyloid plaques, its activity being more promising than the existing anti-Alzheimer's drugs. Additionally, antioxidants found in papaya, water-melon, tomatoes and pink grapefruits have been shown to prevent several types of cancers and cardiovascular disorders.

This era of rapid urbanization has seen an emerging trend of expressing many of the aforementioned medicinal and nutritional traits into other food crops transgenically. Although several people have shown their concerns as to its biosafety, but such drawbacks haven't been reported to this date. Further, another technology called chloroplast transformation is available to develop environmentally friendly (biosafe) transgenic crops [5-9] like lettuce. This technology offers several superior advantages like overexpression of transgenes up to 70% due to polyploidy at organelle and genome (plastome) levels, accumulation of biologically active proteins due to the presence of chaperonin proteins and natural containment of transgenes since plastids are transmitted to next generation through ovary, rather than pollen that cause horizontal gene transfer, in most of the cultivated plant species. Hence, the transgenics are a promising way-forward to develop cost-effective nutraceuticals.

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