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Micro nutrients and fortification of food commodities

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Abstract

Increasing of micronutrients in food commodities to improve the nutritional values of foodstuff is common practice these days. Fortification of food items with micro minerals has multiple health benefits. It important to study the status of these essential trace elements and vitamin in food items to avoid overload. The effect of deficiency or low intake of micronutrients in human population is an important factor.

Keywords: Food, micronutrients, fortification, micro minerals, essential trace elements

Introduction

The swarming human population and consequent dietary consumption along with shrinkage of the cultivated area due to extensive colonization resulted in the severe depletion of natural food resources on the earth. The shortage of food supply resulted in the extra ordinary price hikes and intentional adulteration of even hazardous material in the eatable commodities, thus leading to malnutrition and maladies in the exposed communities. In the dawn of 21st century, the availability of the natural food will surprisingly be a miracle. Whereas, the supply of the balanced diet will be beyond imagination for a common person. To some extent, to overcome the food shortage problem the idea of fortification of foodstuff was introduced. Generally, the fortification is a science or art of fortifying the dietary commodities with minerals, vitamins and with other vital factor to strengthen the nutritional value of a substance and for some commercial options. This is usually carried out by incorporation of vitamins or minerals in daily consumable foods. Minerals are very important for human health, just like vitamins, human biochemistry is unable to manufacture these minerals co-factors, which are involved in numerous metabolic processes. Therefore, the mineral supplementation is as essential as vitamins to maintain the cellular chemistry of human healthy. Some minerals are required in large amounts i.e. calcium, sodium, potassium, iron, magnesium etc. While zinc, copper, manganese, chromium, cobalt and lead are required in traces. Recently the fortification of foodstuffs with essential trace elements or vitamins is very common but before fortification, it is very much obligatory to study the status of the particular compound or element in the general biomass. Deficiency or low intake of that substance must be established scientifically in majority of the population, before taking any step towards fortification. The daily normal requirement of the metals should be considered as guideline in the quantity of incorporation in the fortification process, to obtain the required therapeutic response and to avoid overloading exposure and consequent injurious complications. Usually the calcium, iron and zinc are the trace elements which are the vastly employed in food fortification process [1, 2, 3, 4, 5, 6]. Elements i.e. having anti-oxidant characteristics are also incorporated to reduce the deleterious effects of free radicals produced in the body during metabolism. Sometime the fortification is carried out for commercial options only or to glamorize the customer. Fortification is also carried out in medicines including veterinary medicines, agro-chemicals and fertilizers to augment the therapeutic response and to enhance the crop output. Different fortified foods with vitamins and minerals are preferable.

Methods of fortification

1. During Cultivation

The magnesium contents in nodules of solanaceous plants can be enhanced by fertilization of magnesium salts [7]. Similarly copper and zinc can be increased in grains or wheat by the addition of copper sulfate and zinc sulfate as fertilizer [8, 9, 10].

2. During Food Preparation

The metallic utensils used for the preparation of food also helps in the fortification of minerals in the foodstuffs. Food cooked in iron cooker or vessels will be added by leaching or corrosion of the wall of the vessel caused by natural dietary acids during cooking. The iron salts of natural acids have biogenic origin, therefore, having ideal pharmacokinetic properties with added advantage of non-toxicity preventing the user from any anemic condition. Similarly, the tin-coated brass utensils can fortify food with zinc, copper and tin. Sometimes utensils made of elements like aluminum etc., which are injurious to human health, may cause increased metallic metal contents in food resulting in hazardous effects [11, 12, 13].

3. During Packing of Food

Some essential elements i.e. sodium, iodine and potassium may be added by incorporation of table salts, iodized salts and potassium salts [14]. In America, citrus fruit juices are fortified with calcium as much as 200 mg/100 ml. Similarly, soybean milk is fortified with calcium, iron and zinc [2, 3, 4, 5]. Sugar can be fortified with iron sodium ethylene diamine tetra-acetate complex for the supplementation of iron and simultaneous detoxification of heavy metal poisoning [16]. Apple juice is fortified with ascorbic acid and iron to enhance the bioavailability of iron [17]. Vitamin C, cold drinks and vinegar are also iron fortified with eggshell, zinc, iron and coral powder to increase the nutritional value [15]. Wheat breads are fortified with zinc [1]. In Europe, beer is fortified with Germanium, which has antioxidant and anti-cancer properties [18]. Usually, the extra pure alcohol is added to wine, which is known as fortified wine [18].

Suggestions

In the fortification of foodstuffs especially of botanical origin, the presence of phytic acids hinders the absorption of minerals through the simple mucosa by making insoluble complexes in the gut. Therefore, the fortification of the wheat bread with iron salts will not be beneficial with respect to iron availability in the bio-system and may not give good results. Another important factor, which is of prime importance, is the antagonistic characters of the minerals at the absorption level through biological membranes when more than one inorganic compound is being incorporated in fortification. For instance, the gastrointestinal absorption of the Zn^{++} is retarded by the presence of Fe^{++} / Fe^{+++} due to their intrinsic antagonistic nature in the biological pool. Therefore, the simultaneous incorporation of two antagonizing minerals in one preparation may fail to fulfill the required pharmacological results. In the prevailing circumstances, the fortification of fruit juices should be carried out by the addition of calcium and milk with zinc salt.

Two different WHO survey reports has established that 80% of the school-going children are zinc and copper deficient, whereas overall 90% of the global population is zinc

deficient. Commonly the children extensively consume lollipops, candies, chewing gums, gams, jellies and other sweets, which should be sold after proper fortification with zinc salt so that the children may also fulfill their demand and lead to healthy active life.

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