International Journal of Basic and Applied Biology
Print ISSN: 2394-5820, Online ISSN: 2349-2539, Volume 2, Number 3; October-December, 2014 pp. 166-168

http://www.krishisanskriti.org/ijbab.html

Food Fortification and Enrichment

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Abstract: *India has always been pinned as one of the greatest agriculture-based countries of the world. A large section of its economy is generated through agriculture produce and manufacture. In spite of the large produce, India has not been able to harness completely the power of food processing and value addition. The different kinds of losses incurred during the processing activities cause the loss of essential nutrients from the food products. This research will deal with the different ways in which the food products can be enhanced in terms of nutrient value and quality. The idea of adequate food processing does not only include high economy generation but should also encompass the quality and nutritional value of the product. Food fortification, enrichment, preservation, etc. are some of the techniques which should be adopted in order to promote the idea of value addition of food products in the food processing industries. Fortification refers to "the practice of deliberately increasing the content of an essential micronutrient, i.e. vitamins and minerals (including trace elements) in a food irrespective of whether the nutrients were originally in the food before processing or not, so as to improve the nutritional quality of the food supply and to provide a public health benefit with minimal risk to health," whereas enrichment is defined as "synonymous with fortification and refers to the addition of micronutrients to a food which are lost during processing. Since, in today's jet-age lifestyle, we not only need food products which are sustainably produced but those which have a high nutrient-value, focusing on value addition of food products is the need of the hour.*

Keywords: *fortification, enrichment, preservation*

1. INTRODUCTION

The agriculture sector of India has always been recognized as one of its best and largest economy-generating sectors. However, the same cannot be said for what follows the sector- the industrial segment of agricultural products. One cannot categorize the native food industries as nascent because they have had a substantial period for growth; rather the growth has now become stagnant. When the world is demanding more and more advancements and arduous procedures to generate nutrient-rich and highly economical food products, India has taken a back seat in this sphere. We do not lack in terms of production but in terms of food processing.

Food processing, and marketing are important for the following reasons:

a) It enables effective substitution of imported food products.
b) It adds value and increases farmers' returns on their produce
c) It expands market opportunities
d) It improves shelf life to overcome seasonality and perishability
e) Post harvest processing, handling and marketing, increases food availability at household and community levels, and thus contributes to food security.

The food processing sector is constrained by: inadequate processing methods, lack of access to equipment and packaging, weak linkages with producers and poor marketing skills. The sector remains largely unexploited, allowing imported foods to dominate internal markets.

2. CONSTRAINTS RELATED TO FOOD PROCESSING AND MARKETING

Rudimentary technologies: There is insufficient capacity to acquire or fabricate food processing equipment locally. These resources are not utilized efficiently in terms of transferring skills and technology to local artisans.

Inconsistent quality and quantity: The quality produced by the industries is weakening at a steady rate. In order to meet the specific levels of quality set by different standards, the industries compromise on quality as well as quantity.

Safety and quality constraints: There is little effort to integrate good practices in production practices, handling activities, storage areas, etc. Most processing facilities have not established modern food safety/ quality management systems

Poor linkages between producers and processors: The major constraint faced by medium scale processing establishments is the weak linkage between producers and processors. Ultimately, this translates into high operational costs that processors pass on to consumers.

Lack of innovativeness and product diversification: There is lack of innovation

and product development in the food processing sector.

Lack of technical expertise: Development of new skills which dovetail with the current needs of the generation is required at every level.

Inadequate artisanal skills: Local artisans are not adequately equipped with tools and skills to repair or maintain the existing food processing equipment.

Inadequate supply of appropriate packaging: Local supply of packaging materials is inconsistent in terms of specifications, quantities and safety.

Poor processing methods: Many of food enterprises use poor processing methods, resulting in food products of inferior quality.

Poor market analysis: There is generally little effort to analyze market requirements and consumer expectations. As a result, production is not market oriented and products do not meet consumer expectations.

Thus, out of the aforesaid issues, this paper would deal with the nutrient value of the food products being manufactured in the industries and how they can be enhanced with the different techniques of value-addition. The objective of this study is to focus on one of the important factors concerning food nutrition and adequate food productivity- value addition of food products. The specific objectives of this study were to develop a value adding strategy through food processing, new product development, food safety and quality management.

3. WHAT IS "SUSTAINABLE NUTRITION SECURITY"?

As a background to discussing *"Sustainable Nutrition Security"* it is important to distinguish between *food* security and *nutrition* security. These are two quite different terms, but often used interchangeably in the literature. The "food security" element is derived from the widely-used definition of food security stemming from the 1996 FAO World Food Summit, where it is defined as the state or condition wherein:

All people, at all times, have physical, economic and social access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

The "nutrition security" element underscores the more general context needed, as reinforced by the recent Lancet Series (Horton and Lo, 2013). These two elements are brought together in the prevailing definition of food and nutrition security (FNS), which states that FNS exists when:

All people at all times have physical, social and economic access to food, which is safe and consumed in sufficient quantity and quality to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active life.

4. WHAT IS VALUE ADDITION OF FOOD PRODUCTS?

Value-Addition is the process of taking a raw commodity and changing its form to produce a high quality end product. Value-Added is defined as the addition of time, place, and/or form utility to a commodity in order to meet the tastes/preferences of consumers. In other words, value-added is figuring out what consumers want, when they want it, and where they want it – then make it and provide it to them.

Thus, value addition in food products will result in nutrient-rich products which have a higher degree of quality, meet the standards set by different authorities and are safer for consumption. Sometimes, value addition can be done purely for commercial gains whereas sometimes it can be done for nutrient augmentation of the food product.

5. FOOD FORTIFICATION AND ENRICHMENT

Food fortification is the process of adding micronutrients (essential trace elements and vitamins) to food. It may be a purely commercial choice to provide extra nutrients in a food, while other times it is a public health policy which aims to reduce the number of people with dietary deficiencies within a population. Diets that lack variety can be deficient in certain nutrients. Sometimes the staple foods of a region can lack particular nutrients, due to the soil of the region or because of the inherent inadequacy of the normal diet.

The four main methods of food fortification (named as to indicate the procedure that is used in order to fortify the food):

1) Bio-fortification (i.e. breeding crops to increase their nutritional value, which can include both conventional selective breeding, and modern genetic modification)
2) Synthetic biology (i.e. addition of pro-biotic bacteria to foods)
3) Commercial and industrial fortification (i.e. flour, rice, oils (common cooking foods))
4) Home fortification (e.g. vitamin D drops)

Some examples of food fortification are Iodized Salts, Folic Acid, Niacin, Vitamin D, Fluoride, Golden Rice, White Rice, etc.

An **enriched food** is a food to which nutrients have been added. Typically, the added nutrients were present in the food in its original form, but were removed at some point during processing. White bread -- to which certain vitamins are added

after the bleaching process depletes them -- is a commonly-consumed enriched food.

While it is true that both fortification and enrichment refer to the addition of nutrients to food, the true definitions do slightly vary. As defined by the World Health Organization (WHO) and the Food and Agricultural Organization of the United Nations (FAO), fortification refers to "the practice of deliberately increasing the content of an essential micronutrient, i.e. vitamins and minerals (including trace elements) in a food irrespective of whether the nutrients were originally in the food before processing or not, so as to improve the nutritional quality of the food supply and to provide a public health benefit with minimal risk to health," whereas enrichment is defined as "synonymous with fortification and refers to the addition of micronutrients to a food which are lost during processing.

Restoration is the addition of a nutrient to a food in order to restore the original nutrient content. Both restoration and enrichment programmes usually involve the addition of nutrients that are naturally available or present in the food product.

Standardization is the addition of nutrients to foods to compensate for natural variation, so that a standard level is achieved. Standardization is an important step to ensure a consistent standardized quality of the final product.

Supplementation is the addition of nutrients that are not normally present or are present in only minute quantities in the food. More than one nutrient may be added, and they may be added in high quantities.

As compared with restoration and standardization, fortification has a special meaning: the nutrient added and the food chosen as a carrier have met certain criteria, so that the fortified product will become a good source of the nutrient for a targeted population. Nutrients added for food fortification may or may not have been present in the food carrier originally.

Effect of processing on the stability of added nutrients

The stability of nutrients is affected by many chemical and physical factors. Consequently, processing parameters must be selected and controlled during the processing of fortified food to minimize nutrient losses.

Compared with vitamins, minerals (iron and iodine) are very stable under extreme processing conditions. The primary mechanism of loss of minerals is through leaching of water-soluble materials. Vitamin A, on the other hand, is very labile in the processing environment. Vitamin A is both oxygen and temperature sensitive. Borenstain and Ottaway have both reported that Vitamin A (and also b-carotene) added to foods is sensitive to oxidative damage. In the form of retinol, vitamin A is more labile than its ester form; for this reason, vitamin A esters are usually used for food fortification. The stability of vitamin A is also strongly affected by pH. At a pH of less than 5, vitamin A is susceptible to oxidation. At low pH, vitamin A tends to isomerize from the *trans* to the *cis* configuration, which has a lower vitamin activity. The problem of low pH is encountered especially during juice processing. Fruit juices usually have a low pH (about 3.0). To compensate for low pH, carbonation, which expels oxygen, may be used to stabilize vitamin A.

6. CONCLUSION

Many factors may cause serious nutrient degradation. Consequently, the proper technology to minimize losses needs to be implemented. Some strategies for stabilizing nutrient content include the application of protective coating for the individual nutrient; the addition of antioxidants; the control of temperature, moisture, and pH; and protection from air, light, and incompatible metals during processing and storage.

The stability of nutrients and the conditions under which fortified foods are prepared, manufactured, and packaged will affect the shelf life of the product and, concomitantly, the nutrient overages. The degree of nutrient degradation in food and the length of the shelf life will govern the level of overage.

Food fortification and enrichment are nutritional intervention programs with a specifically defined target population, and its effectiveness is measured by whether or not the fortified food is accepted, purchased, and consumed by that population. The success of a food-fortification and enrichment programs is measured by whether or not the nutrition and health status of the targeted population has been improved. Therefore, several important aspects should be carefully assessed in the development of a food-fortification and enrichment programs, such as determining nutrient stability under normal conditions of storage and use. From the technical point of view, nutritional stability during formulation, preparation, and processing is crucial for the effective production of fortified foods.

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