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# Emerging Trends in Food Technology



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# Introduction

- **Food processing is generally regarded as a traditional industry but, advances in bio-processing and biotechnology is taking the industry at a faster rate**
- **Biotechnology is multidisciplinary in approach involving chemical engineering, microbiology, biochemistry, genetic engineering**



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# Applications of Biotechnology

- **Qualitative improvement in foods with nutritionally superior proteins**
- **Amylases and proteases are used in the manufacture of syrups and protein hydrolysates in making meat tender**
- **Genetic engineering can play a major role in microbial mass production**
- **Attempts are made to tailor made organisms to produce edible oil with higher quality and yield**



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# Applications of Biotechnology

- **Growing interest in functional foods (nutritional and medicinal) (second generation biotechnology products)**
- **GM crops provide new tools to improve crop productivity, reduced pesticide applications, improve micronutrient content/bioavailability of nutrients**
- **Available GM foods are soyabeans, maize, canola for feed, oil and processed food**
- **Currently in India efforts are being made for developing mustard, brinjal, potato, tomato**



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# Applications of Biotechnology

- **Basic principle of GM technology - DNA is transferred from a cell of one species to another unrelated species and made to express in recipient**
- **Used in modification of oil seeds resulting in products with high oleic acid, lauric acid, iron rich rice variety, rape seed oil with low levels of SFA's**
- **Golden rice is a transgenic variety with genes for the synthesis of  $\alpha$  carotene from *Narcissus pseudonarcissus***



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# Biofortification

- **Biofortification – technique where varieties are bred for increased mineral and vitamin content**
  - **Iron rich rice (International rice research institute)**
  - **Quality protein maize (International maize and wheat improvement center, Mexico)**
  - **High carotene sweet potato (International potato center, Peru)**
  - **High carotene cassava (International center for tropical agriculture, Colombia)**
  - **Golden rice biofortified with pro-vitamin A to overcome vitamin A deficiency**



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# Processed and Convenience Foods

- **Ready to cook (RTC), RTE, RT serve are products that require less time for preparation**
- **Instant rice, pulao, kichdi, halwa are being developed**
- **Defence Food Research Laboratory in Mysore has developed a technology by which chapatis can be stored for six months**
- **Extrusion Technology – is a high temperature short time process where product is pushed out by forcing through die causing minimal loss of nutrients like B complex vitamins**





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# Processed and Convenience Foods

- **Retort processed foods – stored for even one year**
- **Energy bars – grains used may include oats, barley, wheat, corn, rice, rye, millets**
  - **Binding syrup provides sweetening and maintains water activity, provides brown colour and flavour**
- **Engineered foods – composed of a variety of natural/synthetic ingredients which have been modified to simulate the appearance and taste of a particular food product – non dairy coffee creamer**
- **Space foods – nutritious, appealing, palatable, light in weight, less in volume and possess the property of resistance to crumbling**





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# Food Fortification

- **Process whereby nutrients are added to foods (small quantities) to maintain or improve the quality of the diet of a group, or a population**
- **Eliminates micronutrient deficiencies**
- **Multinutrient fortification further increases the cost effectiveness – iron and vitamin C**
  - **Fluoridation of water to control dental caries**
  - **Iodisation of salt to prevent goitre (IDD – Iodine deficiency)**
  - **Fortification of vanaspati and milk with vitamin A&D**
  - **DFS – double fortified salt (iron and iodine)**



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# Food Fortification

- **Fortified cereals – rice is fortified with both vitamin A and iron**
  - **Ultra rice – reconstituted vitamin A or iron fortified rice**
  - **Wheat flour fortification with Vitamin A**
  - **Loss of lysine during baking chapatis is compensated**
  - **Edible oils are fortified with vitamin A**
  - **Fortification of tea with vitamin A**
  - **Curry powder fortification**
  - **Sugar is fortified with vitamin A**



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# Nutraceuticals

- **Nutraceutical combines nutrition and pharmaceuticals – food extracts can be used as preventive drugs or food supplements**
- **Nutraceutical is defined as any substance that may be considered as food or part of food and provide medical and health benefits, including prevention and treatment of disease**
- **Give health benefits by acting as anti cancer agents and influencing positively on lipid blood profile**
- **Also have antioxidant activity and are anti inflammatory, and bone protective**



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# Nutraceuticals

- **Biologically active compounds of plant origin are known as phytochemicals**
- **Phytonutrients identified to have nutraceutical properties include isoprenoids, polyphenolics, phytosterols, and glucosinolates**
- **Terpenes are found in green foods, carotenoids and limonoids (citrus peels) are subclass of terpenes**
- **Phytosterols – yellow vegetables, seeds of pumpkin, help in preventing tumours in prostate gland**
  - **Flavonoids, anthocyanidines, isoflavones are important subclasses of phenols**



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# Nutraceuticals

- **Flavonoids enhance the effectiveness of vitamin C, prevent allergies, tumors, platelet aggregation**
- **Anthocyanidines help in synthesis of protein, collagen while isoflavones present in beans, legumes prevent prostate and breast cancer**
- **Theol – sulphur containing class of phytonutrients – garlic, onion, cabbage; protect against tumours**



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# Modified foods

- **Organic foods - Foods produced without artificial fertilizer /pesticides**
- **Animal manure and compost are used as natural fertilizer and crop rotation further enriches the soil**
- **Biocontrol of pests – fungi and specific insects are used to control pests**
- **Functional Foods – any food that has a positive health, physical performance or state of mind beyond the benefit of nutrition**
  - **Hypocholesterolemic agents such as garlic, fenugreek are functional foods as they protect from heart disease and cancer**



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# Modified foods

- **Probiotics are live microbial food or feed supplements that benefit human and animal health by microbial balance in intestine (yogurt)**
  - *Lactobacillus, Bacillus, Enterococcus*
- **Prebiotics promote the growth of probiotics in the form of specific substrates.**
  - **Non-digestible food ingredients that provide beneficial effects to the host by selectively stimulating the growth /activity of one or more limited number of bacteria in the colon**
  - **Include dietary fiber, honey, banana, onion, oats**