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MICROBIAL WORTH IN FOOD INDUSTRY

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Abstract

Efficient microorganisms such as molds and yeast play an important role in the improvement of the taste and essence of different food items or their ingredients. These efficient microbes or trained microorganisms have a well-known fermentative limit. Cyanobacteria were the first microorganism that emerged on the earth have potential abilities or applications in biotechnology such as in food biotechnology or the food industry. The employment of a Microbial people group in biotechnology now increasing persistently. In food generation, the exploitation of a Microbial people group is very helpful and in counteraction of illness and its cure. Individuals have adequate means for the exploitation of food that is easily susceptible to the characteristic Microbial maturation. The traditional foods in China have a very long-lasting history. Vegetables, beans, grains, and milk are supposed to be unrefined resources employed for maturation, carrying a stock of old items such as conventional matured or developed soy sauce, Chinese alcohol, and vinegar. Food quality and safety are very important at the global level because it affects the welfare, economy, and exchange. Unconceivable information about microbes and growth at their subatomic level is very important for the planning and enhancement of the production of appropriate matured Foods that are full of nutrients. The larger part of the microbes that are used as Food ingredients or Food added substances that have a long history of their harmless use in the production of food. The microbial enzymes also play an important role in the production or processing of different foods. In the food industry, different types of food fermentation are carried out by a variety of microbes or microbial enzymes. Yeast and lactic acid bacteria play a vital role in the food industry. Different food processing technologies are used for the protection of food.

Keywords: Microorganisms, Food fermentation, Microbial enzymes, Food industry, Food protection

INTRODUCTION

The trained microbes for example yeasts, and molds, assume to perform a crucial job in improving the dependability, surface, flavor, and nature of food items. These training opportunities are most expected the outcome of the techniques of food production such as saving and reusing of segregated microbial people groups in the existence of abundant horticulture food supplies. As a result, tamed strains of bacteria with more apparent fermentative limits have emerged. In addition, aging has an important role in the production of numerous intensities, such as lactic acid, bacteriocins, amino acids, and ethanol, which are used as fixes or additives in the food business. The maturation process increases the availability of supplements in some foods, such as bread, which detoxifies various items, and cassava, which enhances the flavor of many substrates (1).

Among the first microorganisms to have possessed the earth are cyanobacteria. The potential biotechnological points of interest of marine cyanobacteria can benefit from the relationship over the fields of nature, science, genomics, wellbeing examination and designing, that outcome in the progression of new advances, including expanding the scope of cyanobacterial metabolites past customary utilization, abundant



saline water assets and rationalize biofuel creation by utilizing non-arable land and adding to the biological structures of things to come (2). In biotechnology, the utilization of microbial people groups is continuously expanding. The transformative adaptability of bacteriological networks and their capability to requirement inconvenient curiosities should be considered to plan strong biotechnological applications (3). Manipulating the microbial people group is beneficial in food generation, in the treatment of wastewater, and for ailment counteractive action and treatment for example treatment of weight and inflammatory entrail illness. (4).

HISTORY OF MICROBES IN FOOD FERMENTATION

Toward the start of the nineteenth century, recognized malady-causing organisms related to the utilization of crude milk which includes *Corynebacterium diphtheria*, *Salmonella typhi*, *Mycobacterium tuberculosis*, and *Vibrio cholera*. *Listeria monocytogenes* and types of pathogenic microscopic organisms have a long history of being related to drain and dairy items, including the way that this pathogen causes serious infection (for example premature births and cerebrum contaminations) in the two people and dairy cattle (5). In the past occasions, individuals had sufficient open doors for the utilization of food that had been innocently exposed to the characteristic of microbial maturation. Rather than lacking learning about organisms, our ancestors recognized, after some time, the antibacterial, deliciousness, pain-relieving, and rationally animating or silencing characteristics of matured foods and drinks. It is so hard to state with security when deliberate aging began vigorously; nonetheless, obsolete neolithic bowls recommended that the purposeful maturation of rice, organic product, or nectar drinks shares remained for all intents and purpose practice for near ten thousand years. In the mid-1990s, new methodologies in the description of microbial people group seemed to be through the advancement of culture-autonomous strategies, for example, temperature inclination gel electrophoresis (TGGE), terminal limitation piece length polymorphism (T-RFLP), denaturing slope gel electrophoresis (DGGE), and a few different systems are still generally utilized today (6). Once in a while, RNA was favored as the focus rather than DNA that may emerge from inert or dead cells. Since RNA is even more effectively disgraced, it permits us to acquire a structure of the microbiota that is conceivably recognizable to the distinctive inhabitants. A new application that is fascinating and relative, for example, amplicon based HTS, is its utilization for the checking of microbial masses past the species level (7). Microbial digestion systems using temperature-advancement were persistent with the metabolomics profiles of proteins and unpredictable natural blends in the cheddar. Also, the outcomes determine how handling is driven, microbiome reactions can be controlled to upgrade the creation capability and item quality (8).

The customary aged foods in China, have a lengthy history going back to 1000 years. A vast scope of basic materials including grains, vegetables, milk, meat, tea, grains, vegetables, and beans were utilized for maturation, bringing about a heap of aged items like usually matured vinegar, Chinese alcohol, and soy sauce. Microbiological maturation guarantees the upgraded period of usability as well as talks about other valuable properties on food as far as sustenance, surface, and taste (9). The most recent three decades have been considered by a critical adjustment in the strategies utilized for the microbiological examination of Food. In the late 1990s, various new systems were created and combined with PCR, these techniques offered researchers the chance of considering the biology of complex microbial environments. In that specific circumstance, the expression "culture-autonomous strategies" was made (10).

TYPES OF MICROBES IN FOOD FERMENTATION

Food quality and security are of worldwide significance, particularly because it influences the economy, wellbeing, and exchange. One of the key signatures is an expectation and it is mandatory to help schemes to deliver sheltered and quality Food and proteomics infers a genuine test in this field because it is equipped for creating fast strategies to find the modification or the nearness of focused proteins in complex food including crude materials and lattices. Salting, solidifying, warming, drying, maturation, and the utilization of synthetic mixtures are the most widely recognized and traditional strategies of protection of food. A portion of the other managing out medicines are less normal (for example microwaves, ultra-high weight, and heartbeat electric fields) or very specific for a few Foods (11). Food aging is the most punctual innovation that is scattered around the world, which appends microorganisms and their catalysts to

improve and differentiate the human eating routine. Incredible information of microorganisms and maturation at the sub-atomic dimension is required for the arrangement and improvement of the creation of manageable aged Foods that have high nutritious characteristics (12). The assembling of aged apple refreshments is spread everywhere throughout the world with specificities in every nation. Apple to Cider is the Microbial Diversity that happens through yeast and microscopic organisms, in which Fungi (yeasts and molds) normally exist on apples and can be found at each progression of juice creation. Microbes dependably do exist from the apple flowers to the final item (13).

In the Food Industry, Dairy Propionic microorganisms are utilized as cheddar maturing starters, as beneficial added substances, and as bio against bacteria. The Screening of a wide scope of accumulations of propionic-microscopic organisms for mechanical and probiotic properties can prompt the development of new practical Foods. Surely, specific populations with medical issues identified with created nations' way of life (prejudice, hypersensitivity, inflammation, malignant growth) will require specific diets (12).

Cyanobacteria are the microorganisms, which are by and by seen as a vital wellspring of supplements and biofuels and structure a basic piece of novel boosted liveliness efficient plans. As we realize that cyanobacteria are autotrophic animals, they are proper for huge scale biotechnological applications because of their low prerequisites for natural supplements (2). The microorganisms present in cheddar assume a significant job in molding its organoleptic and additional physical and substance properties. The current use of high throughput screening DNA (HTS) encourages increasingly exact identification of these organisms, and their useful properties, and can perhaps uncover those microorganisms, and related pathways, that are in charge of good or horrible qualities (14).

The greater part of the microorganisms that are utilized as Food fixings or Food added substances have a long history of safe use in Food maturations. An epic Food is one, which isn't required to have any reasonable nutritious or wellbeing-related properties upon usage. Be that as it may, a wellbeing guarantee would concentrate on the advantages of the novel Food for the client and possibly quarter in its business achievement (15). It's anything but a decent decision to surrender aquaculture for thinking about the Food, business, and remote trade that it produces, and subsequently should be rehashed. There are such huge numbers of substitutes agreed to make aquaculture gradually practical, organisms have been included as a direct Food hotspot intended for refined fish and shellfish, which is a methodology that guarantees to change aquaculture by killing waste. By thinking about waste, as a major aspect of the cycle, it can build stock fixations and reduce discharges of poisons and effective expenses (16). These days, biotechnology goes for the utilization of microorganisms and their compounds, by fermentation, amino corrosive transformations, or proteolysis for making items with attractive quality highlights regarding the timeframe of accurate usability, season, surface, shading, taste, and mouthful. Besides, it assumes a critical job not just in delivering nutritious Foods in a characteristic, rather economical, and maintainable way internationally yet additionally in the production of Foods with wellbeing proceeding qualities (17).

MICROBIAL ENZYMES USED IN FOOD PROCESSING/PRODUCTION

Bacterial Pro-transglutaminase (MTG) is a compound that is detached from an adjustment of *Streptomyces mobaraensis* that produces covalent cross-joins among protein particles. Since the most recent two decades, considers are being directed on the utilization of MTG in meat Foods to improve their properties, for example, gelatin, water authoritative, cooking misfortune, emulsion dependability, rinse misfortune, and so on. The MTG had been demonstrated as a "protein producer" catalyzing cross-connecting responses among peptide and protein atoms of meat Foods with upgraded practical properties (18).

Since old occasions, microorganisms have been utilized in Food maturation, and the aging techniques are even still connected in the readiness of a significant number of Food things. Microorganisms and their compounds assume a key job in Food projects since they are steadier than plant and individual chemicals. These proteins can be practically delivered by the aging procedures with less existence necessity, and in light of the high consistency of these catalysts, process change, and enhancement should be possible in all respects effectively. Glucoamylases, are those compounds that catalyze the hydrolysis of polysaccharide starch from the non-diminishing end and discharging β -glucose. These Enzymes (Glucoamylases), find the far-reaching scope of uses in the Food Industry, for example for the assembling of

high-fructose syrups and high-glucose syrups. They likewise discover applications in the preparing Industry to improve flour quality, to improve bread outside layer shading, and decrease mixture staling. Proteases are catalysts that catalyze the hydrolysis of peptide bonds that are available in polypeptides and proteins. These are usually utilized in pharmaceutical, cleanser, and Food projects. Lipases are proteins that catalyze the hydrolysis of the long-chain triglycerides, and they normally exist in the stomach and pancreas of people and other creature species for the processing of lipids and fats. In the drink and Food Industry, lipases have primary application in natural product juice, lager, wine ventures, dairy, and heating. Phospholipases are catalysts that specifically separate phospholipids into unsaturated fats and other lipophilic substances. These are commonly utilized in the Food Industry, generally in the creation of oils, in the generation of a few pastry kitchen things, and dairy Industry (19).

Lipases and phospholipases are interfacial proteins that hydrolyze hydrophobic ester associations of triacylglycerol's and phospholipids, correspondingly, and these can meet the necessities of clear mechanical procedure superior to anything that of the local catalysts utilized for food aging (20). Bread cook's yeast is a fixing part that is vital to raise, which quickly changes over sugars into Carbon Dioxide, and makes the mixture ascend in heating (21). Amylase is a compound that is utilized to catalyze the breakdown of starch into sugars. It is magnificently present in human salivation and as a wide use in handled Food Industry, for example, heating, generation of cakes, organic product juices, starch syrups, blending, and arrangement of stomach related guides. Lactic Acid Bacteria is identified with the genera *Lactobacillus*, *Streptococcus*, *Enterococcus*, and *Lactococcus*, which are commonly utilized in the generation of 3-methyl butanal in cheddar and milk (22).

TYPES OF FOOD FERMENTATION

Aged foods are the drinks or Foods made through controlled Microbial development and enzymatic modifications of Food parts. These are a piece of the human eating routine and have been delivered and spent since the improvement of human civic establishments. Logically, Fermented Foods are comprehended for their attributes that achieve well-past conservation and arousing characteristics (23). Aged Foods and drinks are acknowledged worldwide because of their improved period of usability, perceptible, wellbeing, usefulness, and healthful properties. A large portion of the matured Foods likewise contains live organisms that may improve gastrointestinal wellbeing and offer other wellbeing benefits that incorporate letting down the danger of sort two diabetes and heart illnesses (24). The Food culture and resolutions in Korea, are advanced with various nutritious and curative qualities. Among the aged foods, kimchi is most usually eaten everywhere throughout the world. It has various nutritive and nutraceutical potential, and its quality is improved by working it with different sorts and measures of constituents and maturation conditions (25).

FERMENTED MILK AND MILK PRODUCTS

The nutritious significance and technology of conventional fermented dairy products are popular everywhere in the world. These consist of yogurt, acidophilus milk, and kefir usually blended with additives to boost the nutritious best of the final product. The starters utilized in dry cultured drinks are streptococcus thermophiles, *Lactobacillus acidophilus* (Los Angeles), *Lactobacillus bulgaricus*, "Kefir grains", and *Bifidobacterium* childhood amongst others. The most crucial classes of Fermented Milk and its products include cultured kinds of milk with mesophilic organisms and thermophilic kinds of milk. Mesophilic lactic cultures are those which commonly grow in the temperature range of 10–40°C and encompass group N streptococci. By way of decreasing of pasteurization temperature of milk, its outcomes in lowering firmness and delayed acidification. The tremendously excessive temperature processing sterilizes the milk and different excessive temperature treat milk, which brings about lower viscosity, and the final taste is the result of a combination of mixtures present in a certain ratio (26).

VEGETABLES/FRUITS PRODUCTS

With the increase in the world's population, lactic acid fermentation is presumed to grow to play an essential part in sustaining fresh results, greens, and different Food objects for feeding the human race. There's a particular amount of Food substances and components, which can be introduced to the fermented

Foods, consisting of sugar, salt, and monosodium glutamate (27). At that point customers of Soy, generally, use to find exchange protein sources from creature ones due to a vegetarian lover style of Food selection; in any case, worries for soy security in bosom most diseases and thyroid influence. Veggie lovers abstaining from food usage has stretched out over the past couple of quite a while together with the arrangement of soy substitutes. The imperative thing nutrients in soy, for example, proteins, minerals, nutrients, and phytochemicals, are likewise ordinary by method for other plant Foods, so it isn't basic in veggie lover eating routine to ordinarily pick soy and soy foods (28).

FERMENTED DRINKS

Around the sector, clients are increasingly aware of the connection between nutrition and fitness. The phase of this market largely comprises Foods that are meant to enhance gut health which includes probiotics, prebiotics, and syn-biotics. With the help of Nanoscience, novel items can be formulated, like cereal-based total beverages, with the potential to reap syn-biotic characteristics which include additional fitness development molecules without affecting their physical, chemical, rheological, and sensorial traits (29).

LEGUME-BASED FOODS

The manufacturing of legumes worldwide is presently prosperous due to their nutritional and commercial importance. Those are a very good supply of nutritional protein, fiber, low-carbo glycemic index, and lesser fat contents, and their consumption has been related to affectation, that's because of the presence of soluble fiber and α -galactosidases, and several other privilege strategies, inclusive of soaking, cooking and fermentation are frequently used to lower the affectation (29). In lots of parts of Nigeria, Ugba is a vital part of the eating regimen of human beings that are shaped through an herbal fermentation of the oil bean seeds, in which the important microbes concerned are *Bacillus* species. Those microbes metabolize the protein content material of the seeds into ammonia and amino acids that have undergone a biochemical reaction in the course of the fermentation method is called proteolysis (30).

IMPORTANCE OF YEAST AND LACTIC ACID BACTERIA IN THE FOOD INDUSTRY

The origination of microbiology, become the improvement in the 19th century of cultural practices the usage of strong or liquid media. Viable microorganisms authorized through the way of life, to be prominent and remoted, and provided biomass for in addition analysis. Microorganisms, in food Microbiology, as infectious pathogens and toxin creators, which might be a safety problem (31). Foods and liquids that are gone through fermentation, provide some of the benefits together with longer shelf lives and the delighted impact. Energetically, the techniques for fermentations have become more cultivated and extra delicate. A number of the other uses for fermentation have become deceptive and using yeast for business functions sparked a very new discipline of research and improvement (32). The Hong Qu glutinous rice wine is a traditional alcoholic drink that is ready via fermenting cooked rice ingesting a starter comprising *Monascus-Purpureus*, and the bacterial institution of Hong Qu starters became immensely variable in species composition and dominated through *Bacillus* sp. Lactic acid bacteria (33).

Yeasts are considered key gamers of a massive style of traditional and superior tactics and different high-fee bulk and first-class chemical substances. (34). Yeasts are one of the most beneficial microbes, which are involved in lots of business strategies (wine, beer, bread, distillates, cider, sake, kefir), in which they destroy down sugars, ethanol, CO₂, and different metabolites, for this reason contributing to the chemical arrangement, sensory excellent, and traditional features of fermented Food and drinks (35).

Lactose-unfastened milk can provide vital nutrients which might be part of ordinary dairy merchandise, like calcium and nutrients, for people who aren't capable of digesting lactose. The products of this category currently have a sizable and growing fitness charm to customers (36) using the probiotic stress *Lb. plant arum* L4 alongside *Ln. mesenteries* LMG 7954, virtually influenced the fermentations through sterilizing the fine of the final product with the addition of probiotic properties, shortening the fermentation period, and imparting the possibility of low salt fermentation, that is superior in disburdening wastewater (37). Microbial ecology of the cheese, its variety is based on a complex boundary among starter lactic acid

micro-organism (SLAB) and nonstarter lactic acid bacteria (NSLAB), which might be categorized with the aid of the variant in their skills to develop in a changing substrate, and the ratio between SLAB and NSLAB is managed via the kind of culture brought to the cheese milk, the cheese-making conditions, and the length of cheese ripening (38).

The Histone Gene Locus bodies emphasize the significance of powerful mRNP formation, which might be the precise genes like the ones coding for histones would have their own precise mRNP packaging station, that custom to their necessities (39). Bacteria and fungi are an important part of the soil bacterial network, which plays an amazing position in the recovery of degraded soils through fertility enhancement by affecting nutrient cycles as nicely development in soil shape (40).

THE FUNCTION OF YEAST IN BAKING

The b-galactosidases enzyme had been isolated from such a lot of assets consisting of bacteria, fungi, yeast, greens, and recombinant assets, which grasps importance due to its sizeable usage in Food productions, i.e., inside the manufacture of lactose-hydrolyzed products for those people who are lactose illiberal and the formation of glycosylated merchandise (41). The secreting machinery, that functions in one-of-a-kind yeast species display that despite a huge genetic and physiological assortment of yeast species, some of the vital factors of the secretory pathway often continue to be preserved, wherein the Y. lipolysis received a recognized function as industrial support and an extremely powerful platform for heterologous protein manufacturing (42). A specific microbiota is found in Cheese rinds that are made of both prokaryotes and eukaryotes and the eukaryotes are particularly yeasts and prokaryotes, which include *Actinobacteria*, *Formicates*, and *Proteobacteria* (43).

THE FUNCTION OF YEAST IN BEVERAGES

Several specialized liquids are inflamed with interspecies crosses of *Saccharomyces*, in which as a minimum 4 species of *Saccharomyces* are being worried. Fermented liquids other than the clips of beer, wine, and cider are made of even better diverse mushrooms, and many of these goods have not begun to be industrial so that the molds and different microbes worried can fluctuate dramatically (44). In Turkey, Yoghurt drink, Shal-gam juice, and kefir are the most known traditional fermented non-alcoholic drinks. These traditional fermented drinks are acquired from veggies, and cereals and the final two one is fabricated from milk, in which Shal-gam juice and yogurt drink are molded using lactic acid fermentation. The lactic acid microorganism is the in particularly composed microbiota of these beverages. Yogurt starter cultures are broadly speaking used in the production of business yogurt drinks and on the other hand, both alcohol and lactic acid fermentation arise in kefir. Kefir is ready through the usage of an aggregate of wheat, maize, and rice or their flours and water (45).

FOOD PROCESSING TECHNOLOGIES

Further to being healthy and delightful, Food must be protected from any type of damage or danger. For the Food authorities and Food industries, it isn't very hard to supply safe and natural Food to their customers. Food safety and charter are guaranteed through the preventive measures which might be applied from farm to plate. There are many physical and chemical tactics for the discount of Microbial hazards in Food. In physical techniques, heating, freezing, radiation, filtration, and drying are undertaken and chemical strategies include chlorine primarily based compounds, ozone, and hydrogen peroxide (46).

NANOTECHNOLOGY

Nanotechnology is a positive generation to be hired for Food protection and great applications. Nanotechnology has authorized the formation of packaging; this is dynamic and sharp with higher mechanical and thermal features for the safety of food (46). For the packaging of meat, a new artificial cloth with silver particles has been advanced. This cloth increases the shelf lifestyles of meat by using its anti-bacterial capacity. Nano-drugs contain fish oil which is a supply of omega-three fatty acids which can be included in bread, and these acids are very useful for human health. Nanotechnology-lined tomatoes are having an extended shelf life and feature safety against humidity and oxygen (47). The scale of Nano-

enabled antibacterial Food coatings is proved to be very helpful in the maintenance of purity or sterility of food at some stage in its production and garage, which grasps up the ability for bacterial inactivation (46).

MEMBRANE PROCESSING TECHNOLOGY

The membrane processing era (MPT) is one of the maximum crucial fields of Food technological know-how. Inside the present era, Food industries account for a fantastic percentage of the membrane's general production, of approximately 20 to 30 percent worldwide. All over the global membranes are produced in extra amounts and reveal multi-purpose packages wherein Nanofiltration (NF), ultrafiltration (UF), reverse osmosis (1), and microfiltration (MF) are used extensively. The membrane processing era has its usage inside the protein Industry, alcoholic and non-alcoholic liquids, and egg products over the last 3 decades (48).

ULTRASONIC TECHNOLOGY

The conventional methods of fermentation which include pasteurization and sterilization are currently used for the inactivation of microbes in food products; however, the call for new technology is growing which has a minor effect on the dietary content and trendy of a Food exceptional. Ultrasonic waves have a wide range of utility in the processing and estimate of products, as the Food Industry discovered a few years ago. Ultrasound waves are stress waves with a frequency of at least 20 kHz

The damaging consequences those had been due to the ultrasound waves on microbes are known from a historic time, but the use of ultrasound is a whole lot newer to sell or manipulate their pastime. Ultrasound with a higher frequency is utilized in the food industry as a non-negative, non-invasive systematic strategy for first-class assertion, method statement, and management, while sonication with a lower frequency is employed for process strengthening. Using each excessive and coffee frequency ultrasound has been inspected for decades in the fermentation Industry. Low-frequency ultrasound is operated for the improvement of fermentation charges, pasteurization, and a number of the other particular processing packages, which consists of wine maturation, growing old, and elimination of gases from alcoholic beverages. Much research concerning ultrasonic waves has shown that sound primarily based measurement structures are correct, fast, cost-effective, non-invasive, hygienic, and nice for automation (50).

MICROBIAL WORTH IN THE FOOD INDUSTRY OF PAKISTAN

Yogurt is milk fermented with symbiotic organisms of *Streptococcus thermophilus* and *Lactobacillus delbrueckii* subsp. *bulgaricus*. The use of any *lactobacillus* species in combination with *S. thermophilus* qualifies as an "alternate culture yogurt" Since ancient times, yogurt is considered as an important element of the Pakistani diet, and its popularity remains to grow. Pakistan produces few processed dairy products despite being a prodigious milk producer. In Pakistan the manufacturing of milk has traditionally been restricted to unpackaged sour milk and yogurt. On the other and the packaged and branded yogurts, are more prevalent amongst rich users who values the safety and effectiveness of the product. Chemical adulterants and microbiological contaminants have been found in both branded and unbranded yogurts sold in urban areas of markets of Pakistan.

Pickling is one of the oldest and most effective food preservation processes known to man. Pickle quality is determined by maintaining optimum acidity, salt content, temperature, and hygienic conditions. Beneficial bacteria found in fermented pickles can help to suppress dangerous gut microorganisms. Pickle is made in Shikarpur using twenty-five different agricultural items such as mango (carry), chilies, lemon onion, and so on, and is divided into three categories: oil, vinegar, and water. Soybean oil is used to make export quality pickles. In Shikarpur, there are twelve pickle-making facilities and fifteen pickle-selling establishments. Various producers have created stores in various towns around the country, such as Quetta, to export the product to Afghanistan and Iran.

The sea buckthorn (*Hippophae rhamnoides*) can be found in Pakistan's Chitral and Northern Areas. It is normally found in the Karakoram and Himalayan mountain ranges. Pulp of Sea buckthorn is used for vinegar production in Pakistan by using biotechnology process. The culture of *Acetobacter aceti* is used for the preparation of vinegar in Pakistan.



For commercial manufacture of bio-pigments for food additives, colorants, and bio-medical uses, algae, fungi, yeast, and numerous types of pigmented bacteria isolated from various environmental sources are used. Astaxanthin, canthaxanthin, carotenoids, flavins, lycopene, melanins, monascins, prodi-giosin, and violacein are some of the pigments produced by these microbes. These pigments not only serve as coloring agents, but they also provide a wide range of health benefits, such as antioxidant, anti-cancer, anti-fungal, anti-bacterial, anti-inflammatory, anti-cholesterol, anti-biofilm, and immuno-regulatory properties. It is consequently critical to identify new and original natural colors derived from microorganisms to increase the economic effectiveness of food products.

CONCLUSION

The variety of microorganisms has a crucial role in industry of food to improve food quality and its shelf life. Cyanobacteria, yeast, and lactic acid bacteria have a major role in the food industry. Microbial enzymes also have a very beneficial impact on the food industry. Different type's food fermentations are carried in the food industry. Foods can be protected from any type of danger by using different food processing technologies.

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