Microorganisms play an important role in human life by influencing agricultural crops, which are raw materials used in the production of food. Agriculture is positively impacted by microorganisms that promote the welfare of plants, including those that promote better growth and yields, improve soil condition, and fight pathogens and crop pests. In food production, the role of beneficial microorganisms is primarily to give favorable sensory characteristics to food, while also preserving it and imparting functional properties, e.g., probiotic properties. Starter cultures and probiotic strains play such a role. Nevertheless, much research is still being carried out on the acquisition of new isolates from the environment and food products in order to gain an understanding of their metabolism and properties, and thus, compose new cultures for use in the production of traditional and functional foods.

This Special Issue is in line with these trends and presents articles that focus on beneficial microorganisms and their possible future use as starter cultures or biopreparations for agriculture. The subject matter is very extensive, so this issue only briefly presents the results obtained by numerous research centers around the world.

A total of six papers (five research papers and one review paper), from various fields of microorganism application in agriculture and food, are presented in this Special Issue. Individual topics include the role of lactic acid bacteria, including probiotic and potentially probiotic bacteria added to food products of animal and plant origin (4); the microbiota found in spontaneously fermented wines (1); and plant growth-promoting actinomycetes (1). In their review paper, Wieczorek and Drabińska [1] summarized the formation of taste and aroma compounds, which are generated via various metabolic pathways from many precursors present in raw materials during the fermentation of Brassica vegetables. The authors closely investigated the flavors of two of the most commonly eaten fermented Brassica products worldwide: sauerkraut and kimchi. They stated that metabolic profiling has gained some scientific attention, but more further efforts must be made to determine the effects of individual lactic acid bacteria on the formation of flavor-providing compounds. Rocchetti et al. [2] reversed the classic bottom-up approach of starter cultures to perform an in vitro evaluation of the probiotic properties of microbes that are already commercialized and employed in the dairy sector. They reported that some L. plantarum and L. rhamnosus strains showed probiotic features, such as an ability to survive under simulated oro-gastrointestinal stress; strong inhibitory activity against harmful bacteria; Caco-2 adhesion; and the exhibition of anti-inflammatory action against THP-1 macrophages by cell-free supernatants. Nonetheless, future in vivo studies are necessary to validate these observed beneficial properties and to evaluate any effect of the vehicle product on the probiotic properties. Paszczyk and Tórska [3] analyzed milk and milk products (pasteurized milk and yoghurts) do determine their composition of fatty acids, especially cis9trans11 C18:2 (CLA) acid; their mineral content; and their lipid quality indices. The results showed that milk pasteurization and milk fermentation with selected starter cultures enriched with Bifidobacterium bifidum BB-12 had a significant impact on the fatty acid profile and on the micro- and macroelement content. The starter culture applied (FD-DVS YC-X16 Yo-Flex...
with BB-12) caused a significant increase in CLA content. The authors concluded that the appropriate selection of lactic acid bacterial strains, in addition to appropriate production process conditions, may result in fermented milk products being naturally enriched in CLA isomers, which could become a new trend in the dairy market. The next research article, written by Pytka et al. [4], concerns the isolation, genetic identification, and verification of the probiotic properties of selected Lactococcus lactis isolates obtained from Polish fermented cow milk, and the best strains for producing cottage cheese with good rheological and sensory characteristics. As a potential industrial starter culture with probiotic potential, L. lactis A13 and A14 strains were selected as the most promising. Further research into the probiotic potential and safety of the strains and their exact contributions to the formulation of the cottage needs further investigation.

The next subject in this Special Issue concerns the spontaneous fermentation of wine microbiota, which affects the properties and sensory characteristics of wines. Kordowska-Wiater et al. [5] analyzed the microbial diversity of Polish red wines and their key properties, and combined them to gain a better understanding of the processes through which these sensory attributes are created. Metagenetic analysis showed that the bacteria Tatumella ptyseos and Leuconostoc pseudomesenteroides, and the yeasts Saccharomyces cerevisiae, S. cariocanus, and Hanseniaspora uvarum, were the most abundant in wines obtained from grapes from various vineyards. This knowledge may be useful in the development of unique local starter cultures for the production of wines with specific characteristics. In the last article, Dominguez-Gonzales et al. [6] assessed and compared the ability of isolated plant growth-promoting actinobacterial strains to form biofilms on a carrier (perlite), with the aim of improving survival and colonizing the rhizosphere and roots of wheat Triticum aestivum, and improving the interactions and benefits to the plant. For three isolates, the authors observed successful consortia formation for mixed-strain treatments; this suggested this bacterial strain’s potential for long-term plant recolonization and as a bio-fertilizer in agriculture to improve crop production and ensure plant health protection.

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