Consumers are increasingly aware of the health benefits associated with probiotics, which are live microorganisms conferring health benefits to the host. Innovations in starter culture production involve the incorporation of probiotic strains like Bifidobacterium and Lactobacillus acidophilus into yogurt cultures. This not only enhances the yogurt's digestive health benefits but also opens up new market segments for functional foods.

Advancements in fermentation technology have given rise to precision fermentation, where specific compounds are produced in controlled environments. In the context of yogurt production, this means precise control over the production of flavor compounds, texture-enhancing molecules, and bioactive peptides. Precision fermentation allows for the consistent and scalable production of high-quality yogurts.

Catering to the increasing demand for plant-based products, researchers are developing starter cultures suitable for plant-based yogurt alternatives. This involves selecting cultures that can thrive in non-dairy environments, such as those based on soy, almond, or coconut. Plant-based yogurt cultures contribute to the growing market of dairy-free and vegan-friendly products.

The emerging field of synthetic biology has made a significant impact on starter culture development. Synthetic biology techniques enable the design and construction of entirely new biological systems for yogurt production. This approach offers unparalleled control and precision in tailoring cultures for specific yogurt varieties.

While innovative approaches in starter culture production offer tremendous opportunities, there are challenges to address. Safety, regulatory compliance, and consumer acceptance are critical considerations. Striking a balance between innovation and adherence to industry standards is essential for the successful implementation of new technologies [2].

Innovations in the production of starter cultures for yogurts represent a dynamic field with the potential to revolutionize the yogurt industry. From genetic modification to precision fermentation and plant-based alternatives, these approaches offer exciting possibilities for creating healthier, tastier, and more diverse yogurt options.

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FERMENTATION PRODUCTION STEP AND ADDICTION MECHANISM FOR INCLUSION OF BREWING ADJUNCTS

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Such manufacturing step in the sequence as fermentation is a candidate for producing a functional beer due to its technological flexibility. On the one hand, this step’s flexibility derives from the participation of a living organism with several active metabolic pathways. On the other hand, this same feature adds complexity to this production step. Although the biochemistry of the fermentation itself is well established, recent advances in the integration between genomics, transcriptomics, and metabolomics of beer yeasts have unraveled in detail its main metabolic routes [1]. Moreover, genetic engineering allows the manipulation of genetic material to improve the production of certain metabolites. Aromatic amino acid metabolic pathways, for example, are cited as candidates for enhancement through genetic manipulation of *Saccharomyces cerevisiae*, as it is possible to produce flavonoids and stilbenes from glucose via aromatic amino acid precursors [2]. Therefore, the fermentation step offers a double opportunity to obtain bioactive compounds: directly from the adjuncts themselves or from the metabolization of compounds aggregated with adjuncts.

Cho et al., investigated the direct effects of adding persimmon fruit in the fermentation stage [3]. This approach can be considered an initial feasibility study for applying fruit at this stage. They examined a range of concentrations between 50–200 g of fruit per 10 L of water and how the fruit impacts brewed the resulting beers' quality characteristics and antioxidant activity. The choice of this fruit encompassed both the rising local productive potential and nutritional aspects of interest in the fruit.

The tests included pH, titratable acidity, alcohol concentration, instrumental color, total phenolic content, and antioxidant capacity. A significant increase in pH and titratable acidity were attributed to the fruit's high pH and production of organic acids, respectively. However, no changes in alcohol content were found. Such a result is positive, as one of the obstacles in adding fruits in the fermentation step is the possible additional alcoholic fermentation from the fruit sugar. However, it is recommended that studies in this area include storage experiments and post-production analyses to assess the effects of these pH variations as they can negatively affect the product during storage. Indeed, is reported in the literature that lower pH values lead to greater oxidation of isohumolones and less flavor stability during storage [4].

The viability of adjuncts addition in fermentation is corroborated by Nardini and Garaguso. In their work, the researchers characterized the bioactive compounds and determined the antioxidant activity of commercial fruit-beers [5]. In detail, raspberry was added to a lambic-style beer, while fresh pieces of cherry, peach, apricot, grape, plum, orange, and apple were added to ale-style beers. Orange beer stood out, in comparison with others, displaying the second-highest value of total polyphenols, despite being the beer that utilized the lowest amount of fruit (0.5 % *w*/*v*) compared with the other fruit beers analyzed. This result was achieved because orange peel is richer in phenolics than its pulp. Orange peel has an elevated nutritional value and contains several antioxidant compounds, including ascorbic acid, flavonoids, and pectins [6]. Indeed, different parts of the fruit can be used and should be tested as their composition affects the final incorporated bioactive molecules differently.

The total polyphenols content was influenced by the amount of fruit used and the beer style adopted [5]. The influence of beer style becomes apparent when comparing lambic and ale raspberry beers. Although the ale style received three times more raspberry than the lambic counterpart, it showed a lower total polyphenols content value. On the other hand, the higher amount of fruit added to the ale style raised the antioxidant capacity and total flavonoid content to values higher than the lambic style.

The fermentative performance also requires special attention when higher percentages of fruits are supplemented to the sweet wort. Nunes et al., and Melo et al., related the addition of 30 % of cocoa pulp and 29 % of bush passion fruit pulp, respectively, as a complement to malted barley [7, 8]. This procedure was accompanied by a temporal evaluation of the following common fermentative parameters: cell growth, substrate consumption (glucose, fructose, maltose, and maltotriose), and ethanol production. Analysis of these three indices allows for the follow-up of the fermentative efficiency and control. In addition to the genetic characteristics of yeast, it is known that a high initial load of fermentable sugars and the concentration of ethanol are primary inhibitors of yeast growth [9]. While Melo et al., evaluated different concentrations (10 %, 29 %, 39 %, and 49 %) of bush passion fruit pulp, Nunes et al., investigated a single concentration applied to two strains of *S. cerevisiae* (SC52 and S-04). While the former found the highest ethanol production with 39 % pulp, the latter indicated SC52 strain as the one that responded best in substrate consumption and ethanol production with a high viability percentage. These represent two viable ways to produce fruit beers, the control of fruit content or the selection of specialized yeast strains.

In addition, banana juice used by Carvalho et al. also proved to be viable as a partial substitute for an all-malt wort. The group recorded volumetric productivity in ethanol of approximately 0.60 g/L·h [10]. This value is close to that obtained by Nunes et al. after 84 h of fermentation with both strains.

Functional beers are a viable and little-explored option within food science to provide human health benefits. The production of these non-traditional beers requires a combination of the added adjunct and an addition step.

Although the transfer of bioactive substances from the adjuncts to the final beer is proven, the direct benefits to human health are substantial. From the technological perspective, state-of-the-art techniques such as LC-MS must be employed to profile the bioactive compounds incorporated into the beverage. Furthermore, it is necessary to establish a circular work, addressing how and which adjunct will be added taking into account the physicochemical, sensory, and physiological terms as bioavailability. Then, the functional claim on these beverages will be completely supported. However, as a new frontier in beer science, the field of functional beers offers a valuable and rich path for new studies.

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ASSESSING THE RISK OF THE ANIMALS NUMBERS OUTBREAK BY SYSTEM PARAMETERS OF THEIR PROTECTIVE COLORS

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Assessing the risk of the fast increasing of the animal's numbers (carriers of dangerous infections or agricultural pests) is an important aspect of biosafety. A common cause of such