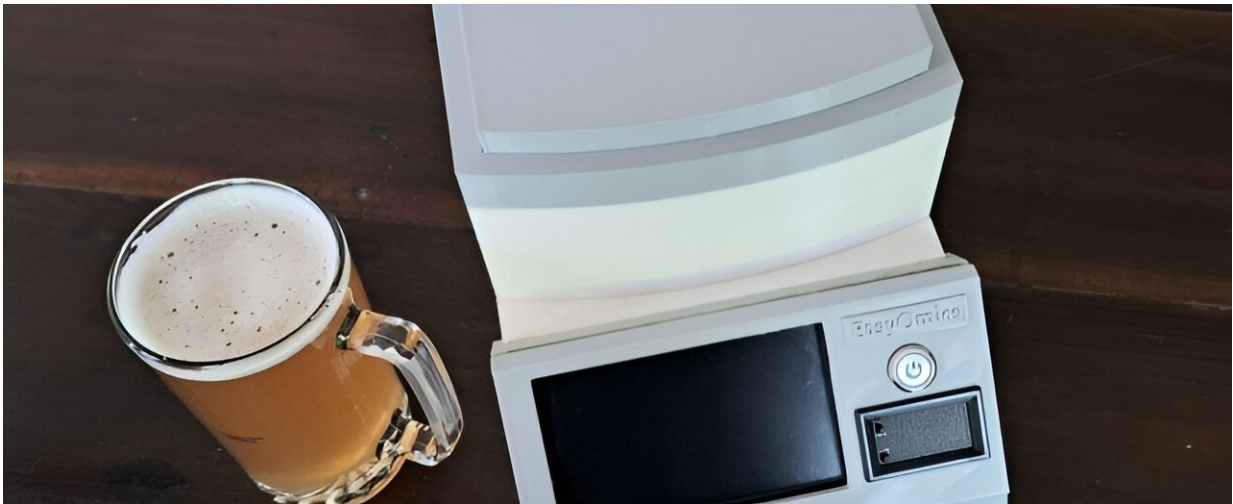


System detects microorganisms that mar the quality of beer

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A startup supported by FAPESP is developing a solution to detect beer spoilage microorganisms, which affect flavor and aroma, both in the brewery and at the point of sale. Credit: EasyOmics

With the aid of molecular biology, the quality of Brazilian beer—the country's most popular alcoholic beverage, especially during the summer—may soon be significantly enhanced.

Researchers at EasyOmics, a startup based in Mogi das Cruzes, in metropolitan São Paulo (Brazil), are using techniques unique to this scientific discipline, which studies the physical and chemical structure of

macromolecules, to develop a system that detects the presence of microorganisms capable of marring beer's flavor and aroma.

The tool can be used by [breweries](#) in all stages of beer production and at points of sale.

"Breweries already watch out for beer spoilage microorganisms not just in the end-product, but also in samples collected at key points along the production line," said Rene Aduan Junior, a biotechnologist and master brewer at EasyOmics.

"With the tool we're developing, it will be possible to do these checks at various other points in the process, from raw material to point of sale. It will detect the presence of beer spoilage microorganisms faster and with greater sensitivity and precision."

Proof of concept has been completed and, according to Aduan, the system will be in use at breweries before the year is out. "We're on our way to finalizing a prototype for use by breweries," he said.

A conventional device for this purpose costs between BRL 50,000 and BRL 60,000 (now about USD 11,500). "We want to offer a cheaper option for smaller breweries. Although the giants dominate the market, with a share approaching 90%, we want to offer a solution for micro, small and medium producers. We know how important it is to help innovation penetrate areas where it's lacking," Aduan said.

The startup's researchers want to develop a simple, compact system that can easily be moved to wherever it is needed. The device should also be intuitive so that it can be operated by anyone without experience in microbiology. "All the user needs to do is collect the sample, which brewers do already," Aduan said.

Fast analysis and decisions

The system works fast and efficiently to produce the requisite analysis, so breweries will be able to make any necessary decisions quickly if spoilage microorganisms are detected. The result is ready in only an hour, compared with one or two weeks for conventional test results. This agility will avoid future adversities in the beer production process.

"The faster it can be done, the better. The longer the liquid is held in the tank, the longer it takes to produce the beer," Aduan said.

If a small quantity of spoilage microorganisms is detected before the bottling stage, they can be eliminated or made inert with seven or eight pasteurization units (PUs). One PU is defined as one minute at 60 °C or the equivalent time-temperature effect on microorganisms. Beer is typically given 10–100 PUs, but five PUs is enough in most cases. "Higher levels of contamination require more PUs," he said.

Pasteurization is a critical stage in beer production, he explained. It consumes a great deal of energy, and unless it is performed properly, problems may occur after the beer is bottled, including a reduction in shelf life.

The solution developed by the startup will enable breweries to match the level of pasteurization to the degree of contamination, optimizing the cost of the process and the shelf life of the end product. This assures microbiological stability with less energy expenditure.

"The end product will be better and the brewery will economize in the process. For consumers, beer produced with the use of our tool will contain fewer microorganisms as the process control will be better," Aduan said.

Quality management

The startup has agreements with several breweries and is working with them to calibrate the system on the basis of comparison with the conventional process. "This stage is complex because each brewer has its own quality management system and the technology therefore can't be a black box. Once this calibration is complete, we'll transfer the knowledge directly into the industrial environment," Aduan said.

Initially, the idea is to offer the solution for the main difficulty faced by breweries and then add tools associated with quality management.

"We plan to familiarize ourselves more closely with the different parts of the production process and create a standard procedure. It will be a learning curve not just for beer but also for wine and other beverages," he explained.

To make optimal use of the startup's solution, breweries need to have a [quality management](#) process up and running, according to Aduan, who has ample experience in beer quality control and is well aware of the importance of integrated solutions that permit a global analysis of the process.

This product quality culture is still in formation among breweries here, in his view, even though Brazil is the third-largest beer producer in the world. It has 1,729 registered breweries, according to the 2022 Beer Yearbook produced by the Ministry of Agriculture (MAPA). Almost 200 million liters of beer are exported annually, and the industry accounts for 2% of gross domestic product (GDP).

"No such integration exists at present, and there's a mismatch between breweries and the requirements of the beer production process, especially with regard to time," he said.

EasyOmics aims to foster use of its device outside the brewery, both before and after production. It is possible to begin by analyzing the raw materials used to produce beer, especially water, malt and hops.

"Much of the process can be performed by the brewery's quality control team. At the point of sale, testing can be done directly at the beer spigot, establishing a new quality control stage in the value chain," he said.

Another interesting point is that the concept can be used in tools for other segments of the food and beverage industry. "We can begin by adding other markets associated with the brewery industry as we continue to develop the solution," he said.

From field to table

The idea of developing the tool came up during a beer-fueled conversation between Aduan and his business partners Regina Oliveira, Daniela Jabes and Fabiano Menegidio—researchers in microbiology and bioinformatics—about possible solutions for the food and beverage industry using molecular biology.

"The industry can benefit from the use of biotechnological processes. In the case of breweries, little use is made of technology in the production process. We want to bridge this gap," Aduan said.

"Proof of concept in a laboratory is different from proof of concept in the industrial environment. In industry, we listen more than talk. We accumulate knowledge, and the product's impact is increased. My [market research](#) shows that demand exists for this solution."

Provided by FAPESP

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