

Covid-19: SU researchers turning bread into hand sanitiser

If you have the right equipment, some ingenuity and a few loaves of bread, it seems you can do almost anything in times of crisis. That is what Stellenbosch University food scientists have proven, having made 18 litres of alcohol-based hand sanitiser from stale bread crumbs in their in-house fermentation tank. After a week-long process, they were able to bottle the end product hours before South Africa went into lock-down because of Covid-19.



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Departmental staff was able to take a good supply of hand sanitiser home. A few bottles were left at the ready in the Food Science building, for when authorised staff visited the facility to check up on the running of experiments.

“It smells just a little bit like toast,” says Dr Stefan Hayward, a postdoctoral researcher in the Department of Food Science at Stellenbosch University (SU).

He is part of a research group in the department who on a normal day focuses on ways to reduce food waste being produced on the one hand, and on another on ways to put these by-products to use.

Raw ingredients

“Waste implies a need to discard something which has become useless and needs to be disposed of. We see waste products and the tendency to produce too much food not as a problem, but as raw ingredients or by-products that can provide the impetus to invent new ways of reducing, reusing and recycling,” he explains the rationale behind their work.

The plan to make their own hand sanitiser came a day after The Presidency announced self-isolation measures, during a brainstorming session between Hayward, another postdoctoral researcher, Dr Timo Tait and MSc food science student Sebastian Orth.

“We were talking about alternative uses for some of the everyday items we often discard, bread being one of them,” remembers Dr Hayward.

One thing led to another, and they decided to try and produce bio-ethanol from bread with which to make hand sanitiser.

“Bread is composed of 40% starch which can be used as an excellent carbohydrate source during the production of bio-ethanol via fermentation,” explains Hayward.

“The global Covid-19 pandemic has highlighted the need for better hygiene practices and adequate supplies of antiseptic products such as hand sanitiser to help ‘flatten the curve’,” he added.

They knew that they’d have no problem finding their main ingredient, because unsold bread past its sell-by date is generally returned to distribution centres from where it is discarded as waste, or at best used as animal feed.

They were able to obtain dried bread crumbs from one of their industry partners, Innovative Research Solutions (IRS). IRS, in turn, is currently helping a major food producer make something worthwhile out of the large amounts of bread returned daily to its distribution centres. The idea is to convert this waste stream into functional ingredients that can be put to new use.

Process

In the department’s fermentation tank, they combined 60 kg of bread crumbs with hot water and added alpha amylase enzymes that are regularly used in the food industry to the mix. They then adjusted the pH level to optimal levels to convert starch to sugar. The mixture was then incubated at 65°C for 60 minutes to enable saccharification and therefore sugar production. Thereafter, the mixture was cooled to 30°C before a specialised yeast strain used by the distilling industry was added.

The end product, which looks very much like mashed potatoes, was left at room temperature for seven days until the fermentation process was complete and they could start distilling the mixture.

From the initial 60 kg of bread in their first batch, they were able to produce 10.5 litres of 75% ethanol. Using a recipe found on the Internet, it was combined with ingredients such as glycerol, hydro peroxide (that also kills viruses and bacterial spores) and a denaturant to ultimately make 18.2 litres of hand sanitiser.

Because of the lockdown the researchers could not continue their work, but they hope to do so once the situation returns to normal in the country.

“We were able to satisfy our scientific curiosity whether or not we would be able to ferment bio-ethanol from a waste product such as stale bread, and at the same time were also able to apply our knowledge to produce an antiseptic formula that can be of help in this time of crisis,” says Hayward.