Popular Science Summary

“Concept development and evaluation of a fibre-based packaging for ready-meals”

By Leonardo Daniel Villegas Hernandez

Plastic packaging for single-use food products is an environmental concern due to its widespread use, slow decomposition, and minimal recycling. These wastes often end up in landfills, oceans, and natural habitats, causing pollution and damaging wildlife and human health.

While plastics play a vital role in ensuring the protection and safety of food products, the industry is actively exploring new materials to reduce their reliance on plastics. However, this transition presents various challenges, including ensuring food safety, promoting environmental sustainability, and maintaining economic viability.

This thesis explores the possibility of using paper fibers as a sustainable alternative to plastics for ready-meal trays. It focuses on Micvac, a food-tech company that has developed a patented packaging and processing technology. This technology can process and extend the shelf life of ready meals to more than 45 days without preservatives, using only a natural vacuum.

The first phase of the innovation research analyzed the feasibility of fiber paper technology in the ready meals category. It was found that consumer demand and new regulations are driving the reduction in the use of plastics. However, paper fibers have weak barrier properties against water, oil, and air, so it is recommended to place a plastic coating inside the paper tray. Otherwise, the food will spoil, and its safety is not guaranteed. If the coating is less than 10%, it can be recycled in most EU countries.

The second phase focused on determining what’s needed to design a paper tray that works with Micvac's technology. Key requirements include using virgin fibers to ensure food safety, adding a plastic liner to protect the product, ensuring the materials can handle microwave and fridge temperatures, and meeting specific size requirements.

Six packaging designs were created in the third phase of research based on the assessment and requirements. An evaluation tool was developed to select the most feasible design, considering sustainability, food waste, technical viability, and business criteria. Two designs were chosen for prototyping. The winning concept consists of a fiber tray and a plastic liner capable of simulating a vacuum-sealed plastic bag. The second concept includes a fiber tray and a plastic liner, leaving a headspace.

Finally, prototypes were tested in a microwave, with positive results, demonstrating the potential for reducing plastics in ready-meals trays using paper fibers.