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Editorial

Advances in Modified Atmosphere Packaging and Edible Coatings

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Food loss is a global concern that not only has a deep economic impact, but also has social and environmental impacts [1]. Food preservation can be dated back to 12,000 BC [2], where natural preservation techniques were mostly predominant. However, with the recent explosion in the global population, new preservation techniques have come as a blessing to mankind. One such technique is modified atmosphere packaging, or MAP, designed to enhance the shelf life of food products by minimal or no usage of any form of preservatives [3]. Respiration rate, microbial spoilage and oxidative degeneration are the major causes of food spoilage [4]. Thus, altering the presence of gases inside the packaging environment can benefit users and producers in preventing food spoilage. In MAP, the initial gases are flushed out from the head space between the food and the packaging lid, and, later, desirable gases are filled in and the head space is sealed [5]. The proportion and type of gas varies with the type of food products. As an overview, red meat may have 30% CO_2 with 70% O_2, and fresh cut fruits and vegetables can have 5% CO_2 to 10% CO_2 and 5% O_2 [6]. The higher oxygen content in the packaging environment helps keep the redness of the meat for longer period [7], whereas higher oxygen and carbon dioxide content is detrimental for fresh fruits and vegetables. The instruments used in gas flush techniques can include a thermoforming packaging machine, vacuum-creating machine and form-fill seal machine (vertical or horizontal). Recently, there has been immense progress in this direction, where skin packaging is combined with vacuum packaging [8] to reduce the material cost without compromising the product's shelf life. The use of oxygen and ethylene scavengers and moisture absorbers are also sometimes an integral part of the MAP.

The next development in MAP usage in terms of environmental impact is edible coatings for food products. These are natural coatings that prevent food loss and food spoilage by enhancing barrier properties coupled with antimicrobial and antioxidant properties. Polysaccharide, lipid and polypeptide coatings are mainly used as edible coatings [9], with the addition of essential oils or organic acids to act as antimicrobial agents. The use of different nanoparticles on the edible films has also enhanced the shelf life of fresh fruits and vegetables [10]. Moreover, the matrix of the edible films can be incorporated with any antioxidants, antimicrobials, nutrients, vitamins, anti-browning agents, enzymes or probiotics to enhance the shelf life of minimally processed food [9]. The use of edible films has also been under investigation due to the reduction in packaging waste after the consumer has used the food product. The other advantage of edible films is that they are biodegradable and are usually made from low-cost materials [11]. The research has also focused on the utilization of agricultural by-products for edible coatings. Recently, different companies, such as Xampla Ltd., Cambridge, UK [12] and Notpla Ltd., London, UK [13], have been using edible films for stock cubes and sachets.

Although there are different advantages to both packaging types, there is a gap in the research in combining these two abovementioned methods. The edible films can be used as

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a primary packaging material along with conventional MAP technology to lengthen the shelf life further [14]. The synergistic effect of these two technologies on the shelf life of fresh produce and even meats [15] can also affect the overall packaging cost and impact. The idea behind this Special Issue is to fill this gap in the research on the combination of these two technologies at any level of application. Thus, we strongly believe that the Special Issue will create a pool of knowledge to drive further research in this direction.

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