CONTROLLED RELEASE OF ALPHA-TOCOPHEROL FROM THERMOPLASTIC STARCH/POLYESTER FILMS INTENDED TO FOOD PACKAGING APPLICATIONS

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Biodegradable materials are emerging as alternative to conventional plastics. In this way, starch/polyester blends are considered a promissory material, since they combine the properties of starch (abundance, low-cost, renewability) with those of a biodegradable polyester with better performance, as poly (butylene adipate-co-terephthalate) (PBAT). Starch/PBAT blends were already successfully obtained by blow extrusion, which represents an important advance in the production of fully biodegradable packaging. In this context, biodegradable active packaging containing antioxidants are a new approach to increase the protection and extension of the food's shelf life. Alpha-tocopherol, or vitamin E, is a lipid-soluble antioxidant commonly found in many foods. Based on this, the aim of this work was to produce thermoplastic starch/PBAT blown films and evaluate the influence of alpha-tocopherol in their mechanical and structural properties in order to obtain a biodegradable active packaging. For this purpose, four different formulations were processed by blown-extrusion. The proportion between the polymeric phases was 60:40 thermoplastic starch/PBAT and three contents of alfa-tocopherol were tested: 0.25, 0.5 and 1.0 g.100g-1. A control formulation, without antioxidant was also produced. The release process of alpha-tocopherol from film into an alcoholic food simulant (1:1 volume ratio) was evaluated by UV-spectrophotometric determination. This experiment showed that, for all the samples, the majority of the antioxidant content in the films was extracted in the first 250 minutes, and a plateau was then achieved. The mechanical properties of the samples showed that the addition of alpha-tocopherol made the films became brittle (reduced tensile strength) and less extensible (reduced elongation at break), mostly due the structure of alpha-tocopherol which disrupts the matrix organization and leads to discontinuous and fragile regions. This fact is also evident in the scanning electron microscopy analyses, which showed a less cohesive matrix for all

the samples containing alpha-tocopherol and in the barrier properties, with higher water vapor permeability for the sample with 1.0 g.100g-1 of antioxidant. X-ray diffraction analysis pointed to an increase in the crystallinity of the samples with the inclusion of the antioxidant, probably due the interaction of the amylose with the hydrophobic molecule of alpha-tocopherol. The starch/PBAT films incorporated with alpha-tocopherol represent an interesting alternative as biodegradable active packaging for food products, with significant migration from the samples into the food simulant.

Palavras-chave: biodegradable, active packaging, antioxidant, tocopherol