



UNIVERSITÀ DEGLI STUDI DI SALERNO

Department of Industrial Engineering
Master's Degree in Food Engineering

Production and characterization of composite biofilms based on Alginate and Straw

Thesis in
Transport Phenomena

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Abstract

The use of plastic today has become extremely widespread even in agriculture, for example for the conservation of silage. In fact, plastic sheets are highly regarded as they are very resistant and not very permeable to oxygen and water, guaranteeing high protection of the forage. However, the continued use of these plastics has raised an issue in terms of sustainability, so it has become necessary to adopt alternative solutions. Among these, the possibility of applying biodegradable material, such as sodium alginate, which can be easily disposed of once the sheeting is no longer to be used, is being considered in this thesis work. In this thesis, various films based on alginate, glycerin and straw were created, with variable content of the latter, with the aim of creating an elastic but at the same time compact and not very permeable product. Two drying methods for alginate films were analyzed, static oven drying and fan drying. Both methods contribute to a strong removal of water after approximately 4 days but fan drying guarantees a better solution in terms of water removal (mass of film reduced of more than 80% with respect to its initial mass) drying control and moisture content homogeneity. Subsequently, the mechanical properties of the various recipes created were tested. Tensile tests results showed that films with a low straw content are less rigid, reaching an elongation at break up to 92,29%. Mechanical properties are also affected by moisture content: for each recipe, as moisture content increases, Young's modulus sensibly decreases. On the other hand, tests results showed an even higher water vapor permeability (WVP) as the straw content increases, up to $4,12E-8$ g/(cm·h·Pa) for the film containing the highest straw content.

Chapter One

Introduction

In this chapter there is an overview on silages, how they are actually stored and also some information on the latest technologies for silage covering.

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