

UNIVERSITI TEKNOLOGI MARA

**DEVELOPMENT OF INTELLIGENT
FOOD PACKAGING FROM TURMERIC
(CURCUMA LONGA)**

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ABSTRACT

In this study, intelligent food packaging in the forms of film and coating were developed based on starch, chitosan and curcumin extracted from turmeric. Solvent casting method was applied to develop the film. Both of the film and coating were evaluated and compared by their chemical, physical and biological properties. The film was evaluated in terms of tensile strength measurement, FTIR spectroscopy, antioxidant activity before its application on strawberry, and antimicrobial activity as well as color difference parameters after application on the strawberry. In addition, the stability of both film and coating were evaluated by their application on strawberries and to identify their potential use as intelligent food packaging to monitor the freshness of the strawberries at two different conditions which are at room temperature and chiller temperature during 5 days storage. The results obtained shows that both of the film and coating have a greater stability at chiller temperature as compared to storage at room temperature and both have a strong antioxidant activity and strong antimicrobial activity that they delayed the spoilage of the strawberries. Therefore, the film and coating based on starch, chitosan and curcumin can be used to monitor freshness of refrigerated food and have the potential to be used as intelligent food packaging.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND STUDY

Turmeric (*curcuma longa*) belongs to a ginger family, Zingiberaceae, is a rhizomatous herbaceous perennial plant. In India, turmeric in a powder form has been used as traditional medicine to treat disease such as anorexia, cough, diabetes, wounds, rheumatism and sinusitis (Rathaur, Raja, Ramteke, & John, 2012). The compositions of turmeric include 6.3% protein, 5.1% fat, 3.5% minerals, 69.4% carbohydrates and 23.1% moisture (Rathaur et al., 2012). The active compounds within turmeric, known as curcuminoids, inclusive of curcumin, demethoxycurcumin and bisdemethoxycurcumin, are polyphenolic pigments. Of these, curcumin is the primary curcuminoid in the turmeric.

Curcumin, an active part of turmeric is a yellow pigment, can act as indicator for acidity and basicity. In acid or neutral environment, curcumin expresses a yellow colour, while in basic environment, it expresses orange or reddish-brown colour (Supharoek, Ponhong, Siriangkawut, & Grudpan, 2017). These prove curcumin as natural pH indicator. Due to its yellowish-orange colour and pleasant aroma, curcumin is widely used as a colouring agent in food. The IUPAC name of curcumin is *(1E,6E)-1,7-bis(4-hydroxy-3-methoxyphenyl)-1,6hepadiene-3,5-dione*. The solvents in which curcumin is highly soluble are ethanol, chloroform, dimethyl sulfoxide and oils. From the previous study, curcumin was incorporated into both natural and synthetic polymer films to provide the films with antioxidant and antimicrobial properties, also used as sensor to detect volatile amines (Yanina S. Musso, Pablo R. Salgado, & Mauri, 2016). The curcumin was incorporated onto bacterial cellulose membrane which is also called as nata de coco by absorption method, and the membrane was used as a sticker sensor for real-time monitoring of shrimp spoilage, as the membrane was highly sensitive toward acid-base reactions.