Abstract

Self-supporting edible films can form instant soluble pouches those get dispersed into cooking medium along with their contents. If pouches are kept in secondary package to protect from aerial humidity, as external packaging such films can preserve the inherent aroma of foods. The present study was aimed to develop and characterize self-supporting edible films comprising corn starch as the basic raw material and a functional polysaccharide (FP) like amylose (AM), methylcellulose (MC) or hydroxypropylmethylcellulose (HPMC), in various combinations. Plasticizers used were categorized in two groups namely binary (glycerol and water) and ternary (glycerol, polyethylene glycol and water) systems. Preparation of the films involved dispersion of the polymer (6.94%) in plasticizer (93.06%), thermal gelatinization of blend, casting the mass in a thin layer, followed by drying and peeling. Effect of FPs on physical, mechanical, water vapour barrier, optical, and moisture sorption properties of the films were investigated. Blend composition was optimized using one factor cubic model response surface methodology following numerical optimization, taken into consideration FP(s) as independent variable and tensile strength and water vapour permeability of the films as the dependent variables. Effect of incorporation of antimicrobial(s) like benzoic acid (BA), potassium sorbate (PS), and sodium propionate (SP) in the optimized blend was studied on the above mentioned characteristics including thermal and aroma arresting properties of the films. When used as external pouches, degradation of discarded films becomes an issue for its bearing on change in quality of soil; effect of biodegradation of starch-HPMC film on quality of the soil was investigated.

All the films produced, irrespective of compositions, were self-supporting, easy to handle, and flexible, with thickness and density ranging within 65-105 μm and 939 to 2139 kg/m^3, respectively. Incorporation of FP improved the tensile strength and water vapour permeability for upto a certain concentration, whereas elongation, tear resistance and puncture strength improved mostly over the whole range of addition. Functional polysaccharide(s) also rendered beneficial effect on optical properties. Among all the FPs, only MC could lower equilibrium moisture content of starch film at 25 to 45 ^{o}C, for both the plasticizer systems, while AM and HPMC decreased in case of binary system only. Incorporation of antimicrobial(s), especially PS adversely affected the film properties compared to that of BA and SP. Heat sealed film pouches (with all FPs) indicated their suitability for pouching both tea and Maggi tastemaker without deterioration in aroma and other qualities, when stored with a secondary package for 90 days at room temperature. Starch-HPMC pouch maintained the overall quality of tea in the best way, even better than tea packed by aluminium foil pouch. Starch-HPMC pouch also showed better performance than films containing MC and AM for tastemaker. Biodegradation of buried film in no way deteriorated the fertility of the soil; rather it improved the quality with higher level of available nutrients.

Keywords: Self-supporting edible film, corn starch film, starch film with functional polysaccharide, edible pouch, biodegradation of starch film.